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THE

# INDIAN CALENDAR

(105)

# THE INDIAN CALENDAR

WITH TABLES FOR THE CONVERSION OF HINDU AND MUHAMMADAN INTO A.D. DATES, AND VICE VERSÂ



BY

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AND

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WITH TABLES OF ECLIPSES VISIBLE IN INDIA

BY

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*Of Vienna.*



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# PREFACE.

I.

THIS Volume is designed for the use, not only of those engaged in the decypherment of Indian inscriptions and the compilation of Indian history, but also of Judicial Courts and Government Offices in India. Documents bearing dates prior to those given in any existing almanack are often produced before Courts of Justice as evidence of title; and since forgeries, many of them of great antiquity, abound, it is necessary to have at hand means for testing and verifying the authenticity of these exhibits. Within the last ten years much light has been thrown on the subject of the Indian methods of time-reckoning by the publications of Professor Jacobi, Dr. Schram, Professor Kielhorn, Dr. Fleet, Pandit Śaṅkara Bâlkṛishṇa Dîkshit, and others; but these, having appeared only in scientific periodicals, are not readily accessible to officials in India. The Government of Madras, therefore, desiring to have a summary of the subject with Tables for ready reference, requested me to undertake the work. In process of time the scheme was widened, and in its present shape it embraces the whole of British India, receiving in that capacity the recognition of the Secretary of State for India. Besides containing a full explanation of the Indian chronological system, with the necessary tables, the volume is enriched by a set of Tables of Eclipses most kindly sent to me by Dr. Robert Schram of Vienna.

In the earlier stages of my labours I had the advantage of receiving much support and assistance from Dr. J. Burgess (late Director-General of the Archæological Survey of India) to whom I desire to express my sincere thanks. After completing a large part of the calculations necessary for determining the elements of Table I., and drawing up the draft of an introductory treatise, I entered into correspondence with Mr. Śaṅkara Bâlkṛishṇa Dîkshit, with the result that, after a short interval, we agreed to complete the work as joint authors. The introductory treatise is mainly his, but I have added to it several explanatory paragraphs, amongst others those relating to astronomical phenomena.

Tables XIV. and XV. were prepared by Mr. T. Lakshmiah Naidu of Madras.

It is impossible to over-estimate the value of the work done by Dr. Schram, which renders it now for the first time easy for anyone to ascertain the incidence, in time and place, of every solar eclipse occurring in India during the past 1600 years, but while thus briefly noting his services in the cause of science, I cannot neglect this opportunity of expressing to him my gratitude for his kindness to myself.

I must also tender my warm thanks for much invaluable help to Mr. H. H. Turner, Savilian Professor of Astronomy at Oxford, to Professor Kielhorn, C.I.E., of Gottingen, and to Professor Jacobi.

The Tables have been tested and re-tested, and we believe that they may be safely relied on for accuracy. No pains have been spared to secure this object.

R. SEWELL.

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## II.

It was only in September, 1893, that I became acquainted with Mr. R. Sewell, after he had already made much progress in the calculations necessary for the principal articles of Table I. of this work, and had almost finished a large portion of them.

The idea then occurred to me that by inserting the *a, b, c* figures (cols. 23, 24, and 25 of Table I.) which Mr. Sewell had already worked out for the initial days of the luni-solar years, but had not proposed to print in full, and by adding some of Professor Jacobi's Tables published in the *Indian Antiquary*, not only could the exact moment of the beginning and end of all luni-solar tithis be calculated, but also the beginning and ending moments of the nakshatra, yoga, and karaṇa for any day of any year; and again, that by giving the exact moment of the Mesha saṅkrânti for each solar year the exact European equivalent for every solar date could also be determined. I therefore proceeded to work out the details for the Mesha saṅkrântis, and then framed rules and examples for the exact calculation of the required dates, for this purpose extending and modifying Professor Jacobi's Tables to suit my methods. Full explanation of the mode of calculation is given in the Text. The general scheme was originally propounded by M. Largeteau, but we have to thank Professor Jacobi for his publications which have formed the foundation on which we have built.

My calculation for the moments of Mesha saṅkrântis, of mean intercalations of months (Mr. Sewell worked out the true intercalations), and of the samvatsaras of the cycle of Jupiter were carried out by simple methods of my own. Mr. Sewell had prepared the rough draft of a treatise giving an account of the Hindu and Muhammadan systems of reckoning, and collecting much of the information now embodied in the Text. But I found it necessary to re-write this, and to add a quantity of new matter.

I am responsible for all information given in this work which is either new to European scholars, or which differs from that generally received by them. All points regarding which any difference of opinion seems possible are printed in footnotes, and not in the Text. They are not, of course, fully discussed as this is not a controversial work.

Every precaution has been taken to avoid error, but all corrections of mistakes which may have crept in, as well as all suggestions for improvement in the future, will be gladly and thankfully received.

S. BALKRISHṆA DÎKSHIT.

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# THE INDIAN CALENDAR.

## *PART I.*

### THE HINDU CALENDAR.

1. IN articles 118 to 134 below are detailed the various uses to which this work may be applied. Briefly speaking our chief objects are three; firstly, to provide simple methods for converting any Indian date—luni-solar or solar—falling between the years A.D. 300 and 1900 into its equivalent date A.D., and *vice versâ*, and for finding the week-day corresponding to any such date; secondly, to enable a speedy calculation to be made for the determination of the remaining three of the five principal elements of an Indian *pañchâṅga* (calendar), viz., the *nakshatra*, *yoga*, and *karaṇa*, at any moment of any given date during the same period, whether that date be given in Indian or European style; and thirdly, to provide an easy process for the verification of Indian dates falling in the period of which we treat.

2. For securing these objects several Tables are given. Table I. is the principal Table, the others are auxiliary. They are described in Part III. below. Three separate methods are given for securing the first of the above objects, and these are detailed in Part IV.

All these three methods are simple and easy, the first two being remarkably so, and it is these which we have designed for the use of courts and offices in India. The first method (A) (*Arts.* 135, 136) is of the utmost simplicity, consisting solely in the use of an eye-table in conjunction with Table I., no calculation whatever being required. The second (B) is a method for obtaining approximate results by a very brief calculation (*Arts.* 137, 138) by the use of Tables I., III. and IX. The result by both these methods is often correct, and it is always within one or two days of the truth, the latter rarely. Standing by itself, that is, it can always, provided that the era and the original bases of calculation of the given date are known, be depended on as being within two days of the truth, and is often only one day out, while as often it is correct. When the week-day happens to be mentioned in the given date its equivalent, always under the above proviso, can be fixed correctly by either of these methods.[1] The third method (C)

[1] See Art. 138 below.

is a method by which entirely correct results may be obtained by the use of Tables I. to XI. (*Arts.* 139 to 160), and though a little more complicated is perfectly simple and easy when once studied and understood. From these results the nakshatra, yoga, and karaṇa can be easily calculated.

3. Calculation of a date may be at once begun by using Part IV. below, but the process will be more intelligible to the reader if the nature of the Indian calendar is carefully explained to him beforehand, for this is much more intricate than any other known system in use.

## *Elements and Definitions.*

4. *The pañchâṅga.* The *pañchâṅga* (calendar), *lit.* that which has five (*pañcha*) limbs (*aṅgas*), concerns chiefly five elements of time-division, viz., the vâra, tithi, nakshatra, yoga and karaṇa.

5. *The vâra or week-day.* The natural or solar day is called a *sâvana divasa* in Hindu Astronomy. The days are named as in Europe after the sun, moon, and five principal planets,[1] and are called *vâras* (week-days), seven of which compose the week, or cycle of vâras. A vâra begins at sunrise. The week-days, with their serial numbers as used in this work and their various Sanskrit synonyms, are given in the following list. The more common names are given in italics. The list is fairly exhaustive but does not pretend to be absolutely so.

### Days of the Week.

| | | |
|---|---|---|
| 1. | *Sunday.* | *Âdi*,[2] *Âditya*, *Ravi*, Ahaskara, Arka, Aruṇa, Bhaṭṭâraka, Aharpati, Bhâskara, Bradhna, Bhânu etc. |
| 2. | *Monday.* | *Soma*, Abja, Chandramas, Chandra, Indu, Nishpati, Kshapâkara, etc. |
| 3. | *Tuesday.* | *Maṅgala*, Aṅgâraka, Bhauma, Mahisuta, Rohitâṅga. |
| 4. | *Wednesday.* | *Budha*, Baudha, Rauhiṇeya, Saumya. |
| 5. | *Thursday.* | *Guru*, Âṅgirasa, Bṛihaspati, Dhishaṇa, Surâchârya, Vachaspati, etc. |
| 6. | *Friday.* | *Śukra*, Bhârgava, Bhṛigu, Daityaguru, Kâvya, Uśanas, Kavi. |
| 7.[3] | *Saturday.* | *Śani*, Sauri, Manda. |

### Time-Divisions.

6. *The Indian time-divisions.* The subdivisions of a solar day (*sâvana divasa*) are as follow:

A prativipala (sura) is equal to 0.006 of a second.
60 prativipalas make 1 vipala (para, kâshṭha-kalâ) = 0.4 of a second.
60 vipalas do. 1 pala (vighaṭi, vinâḍi) = 24 seconds.
60 palas do. 1 ghaṭikâ (ghaṭi, daṇḍa, nâḍi, nâḍikâ) = 24 minutes.
60 ghaṭikâs do. 1 divasa (dina, vâra, vâsara) = 1 solar day.

*Again*

10 vipalas do. 1 prâṇa = 4 seconds.
6 prâṇas do. 1 pala = 24 seconds.

[1] It seems almost certain that both systems had a common origin in Chaldæa. The first is the day of the sun, the second of the moon, the third of Mars, the fourth of Mercury, the fifth of Jupiter, the sixth of Venus, the seventh of Saturn. R. S.

[2] The word *vâra* is to be affixed to each of these names. *Ravi* = Sun. *Ravivâra* = Sunday.

[3] In the Table, for convenience of addition, Saturday is styled O.

7. *The tithi, amâvâsyâ, pûrṇimâ.* The moment of new moon, or that point of time when the longitudes of the sun and moon are equal, is called *amâvâsyâ* (lit. the "dwelling together" of the sun and moon). A *tithi* is the time occupied by the moon in increasing her distance from the sun by 12 degrees; in other words, at the exact point of time when the moon (whose apparent motion is much faster than that of the sun), moving eastwards from the sun after the amâvâsyâ, leaves the sun behind by 12 degrees, the first tithi, which is called *pratipadâ* or *pratipad*, ends; and so with the rest, the complete synodic revolution of the moon or one lunation occupying 30 tithis for the 360 degrees. Since, however, the motions of the sun and moon are always varying in speed[1] the length of a tithi constantly alters. The variations in the length of a tithi are as follow, according to Hindu calculations:

| | *gh.* | *pa.* | *vipa.* | *h.* | *m.* | *s.* |
|---|---|---|---|---|---|---|
| Average or mean length | 59 | 3 | 40.23 | 23 | 37 | 28.092 |
| Greatest length | 65 | 16 | 0 | 26 | 6 | 24 |
| Least length | 53 | 56 | 0 | 21 | 34 | 24 |

The moment of full moon, or that point of time when the moon is furthest from the sun,—astronomically speaking when the difference between the longitudes of the sun and moon amounts to 180 degrees—is called *pûrṇimâ*. The tithi which ends with the moment of amâvâsyâ is itself called "amâvâsyâ", and similarly the tithi which ends with the moment of full moon is called "pûrṇimâ." *(For further details see Arts 29, 31, 32.)*

8. *The nakshatra.* The 27th part of the ecliptic is called a *nakshatra*, and therefore each nakshatra occupies $\left(\frac{360°}{27}=\right)$ 13° 20′. The time which the moon (whose motion continually varies in speed) or any other heavenly body requires to travel over the 27th part of the ecliptic is also called a nakshatra. The length of the moon's nakshatra is:

| | *gh.* | *pa.* | *vipa.* | *h.* | *m.* | *s.* |
|---|---|---|---|---|---|---|
| Mean | 60 | 42 | 53.4 | 24 | 17 | 9.36 |
| Greatest | 66 | 21 | 0 | 26 | 32 | 24 |
| Least | 55 | 56 | 0 | 22 | 22 | 24 |

It will be seen from this that the moon travels nearly one nakshatra daily. The daily nakshatra of the moon is given in every pañchâṅg (native almanack) and forms one of its five articles. The names of the 27 nakshatras will be found in Table VIII., column 7. *(See Arts. 38, 42.)*

9. *The yoga.* The period of time during which the joint motion in longitude, or the sum of the motions, of the sun and moon is increased by 13° 20′, is called a *yoga*, lit. "addition". Its length varies thus:

| | *gh.* | *pa.* | *vipa.* | *h.* | *m.* | *s.* |
|---|---|---|---|---|---|---|
| Mean | 56 | 29 | 21.75 | 22 | 35 | 44.7 |
| Greatest | 61 | 31 | 0 | 24 | 36 | 24 |
| Least | 52 | 12 | 0 | 20 | 52 | 48 |

The names of the 27 yogas will be found in Table VIII., col. 12. *(See Art. 39.)*

10. *The karaṇa.* A karana is half a tithi, or the time during which the difference of the longitudes of the sun and moon is increased by 6 degrees. The names of the karaṇas are given in Table VIII., cols. 4 and 5. *(See Art. 40.)*

[1] The variation is of course really in the motions of the earth and the moon. It is caused by actual alterations in rate of rapidity of motion in consequence of the elliptical form of the orbits and the moon's actual perturbations, and by apparent irregularities of motion in consequence of the plane of the moon's orbit being at an angle to the plane of the ecliptic. [R. S.]

11. *The paksha.* The next natural division of time greater than a solar day is the *paksha* (lit. a wing [1]) or moon's fortnight. The fortnight during which the moon is waxing has several names, the commonest of which are *śukla* or *suddha* (lit. "bright", that during which the period of the night following sunset is illuminated in consequence of the moon being above the horizon). The fortnight during which the moon is waning is called most commonly *krishṇa* or *bahula* or *vadya* (lit. "black", "dark", or the fortnight during which the portion of the night following sunset is dark in consequence of the moon being below the horizon). The first fortnight begins with the end of amâvâsyâ and lasts up to the end of pûrṇimâ; the second lasts from the end of pûrṇimâ to the end of amâvâsyâ. The words "pûrva" (former or first) and "apara" (latter or second) are sometimes used for sukla and kṛishṇa respectively. "Sudi" (or "sudi") is sometimes used for sukla, and "vadi" or "badi" for kṛishṇa. They are popular corruptions of the words "suddha" and "vadya" respectively.

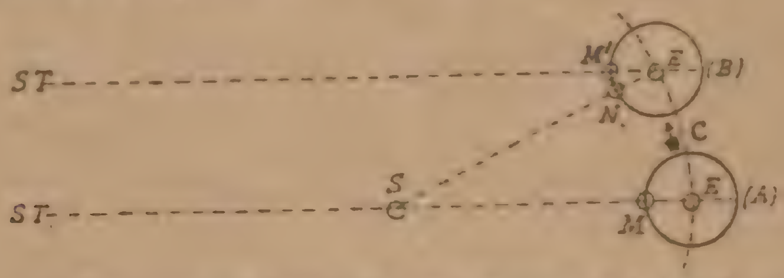
12. *Lunar months.* The next natural division of time is the lunation, or lunar month of two lunar fortnights, viz., the period of time between two successive new or full moons. It is called a *chândra mâsa*, or lunar month, and is the time of the moon's synodic revolution.[2]

The names of the lunar months will be found in Table II., Parts i. and ii., and Table III., col. 2, and a complete discussion on the luni-solar month system of the Hindus in Arts. 41 to 51. *(For the solar months see Arts. 22 to 24.)*

13. *Amânta and pûrṇimânta systems.* Since either the amâvâsyâ or pûrṇimâ, the new moon or the full moon, may be taken as the natural end of a lunar month, there are in use in India two schemes of such beginning and ending. By one, called the *amânta* system, a month ends with the moment of amâvâsyâ or new moon; by the other it ends with the pûrṇimâ or full moon, and this latter is called a *pûrṇimânta* month. The pûrṇimânta scheme is now in use in Northern India, and the amânta scheme in Southern India. There is epigraphical evidence to show that the pûrṇimânta scheme was also in use in at least some parts of Southern India

1 An apt title. The full moon stands as it were with the waxing half on one side and the waning half on the other. The week is an arbitrary division.

2 The "synodic revolution" of the moon is the period during which the moon completes one series of her successive phases, roughly 29½ days. The period of her exact orbital revolution is called her "sidereal revolution". The term "synodic" was given because of the sun and moon being then together in the heavens (cf. "synod"). The sidereal revolution of the moon is less by about two days than her synodic revolution in consequence of the forward movement of the earth on the ecliptic. This will be best seen by the accompanying figure, where ST is a fixed star, S the sun, E the earth, C the ecliptic, M M[1] the moon, (A) the position at one new moon, (B) the position at the next new moon. The circle M to M[1] representing the sidereal revolution, its synodic revolution is M to M[1] plus M[1] to N. [R. S.]




C. A. Young ("*General Astronomy*", *Edit. of* 1889, p. 525) gives the following as the length in days of the various lunations:

| | d. | h. | m. | s. |
|---|---|---|---|---|
| Mean synodic month (new moon to new moon) | 29 | 12 | 44 | 2.684 |
| Sidereal month . . . . . . . . . . . . | 27 | 7 | 43 | 11.545 |
| Tropical month (equinox to equinox) . . . . | 27 | 7 | 43 | 4.68 |
| Anomalistic month (perigee to perigee) . . . | 27 | 13 | 18 | 37.44 |
| Nodical month (node to node) . . . . . . | 27 | 5 | 5 | 35.81 |

up to about the beginning of the 9th century A.D.[1] The Mârvâḍîs of Northern India who, originally from Mârwâr, have come to or have settled in Southern India still use their pûrṇimânta arrangement of months and fortnights; and on the other hand the Dakhanis in Northern India use the scheme of amânta fortnights and months common in their own country.

14. *Luni-solar month names.* The general rule of naming the lunar months so as to correspond with the solar year is that the amânta month in which the *Mêsha saṅkrânti* or entrance of the sun into the sign of the zodiac Mesha, or Aries, occurs in each year, is to be called *Chaitra*, and so on in succession. For the list and succession see the Tables. (*See Arts. 41—43.*)

15. *The solar year—tropical, sidereal, and anomalistic.* Next we come to the solar year, or period of the earth's orbital revolution, *i.e.*, the time during which the annual seasons complete their course. In Indian astronomy this is generally called a *varsha*, lit. "shower of rain", or "measured by a rainy season".

The period during which the earth makes one revolution round the sun with reference to the fixed stars,[2] is called a sidereal year.

The period during which the earth in its revolution round the sun passes from one equinox or tropic to the same again is called a tropical year. It marks the return of the same season to any given part of the earth's surface. It is shorter than a sidereal year because the equinoxes have a retrograde motion among the stars, which motion is called the precession of the equinoxes. Its present annual rate is about 50".264.[3]

Again, the line of apsides has an eastward motion of about 11".5 in a year; and the period during which the earth in its revolution round the sun comes from one end of the apsides to the same again, *i.e.*, from aphelion to aphelion, or from perihelion to perihelion, is called an anomalistic year.[4]

The length of the year varies owing to various causes, one of which is the obliquity of the ecliptic,[5] or the slightly varying relative position of the planes of the ecliptic and the equator. Leverrier gives the obliquity in A.D. 1700 as 23° 28' 43".22, in A.D. 1800 as 23° 27' 55".63, and

1 See Fleet's *Corpus Inscrip. Indic.*, vol. III., *Introduction*, p. 79 *note*; *Ind. Ant.*, XVII., p. 141 *f.*

2 **Compare the note on p. 4 on the moon's motion. [R. S.]**

3 This rate of annual precession is that fixed by modern European Astronomy, but since the exact occurrence of the equinoxes can never become a matter for observation, we have, in dealing with Hindu Astronomy, to be guided by Hindu calculations alone. It must therefore be borne in mind that almost all practical Hindu works (*Karaṇas*) fix the annual precession at one minute, or $\frac{1}{60}$th of a degree, while the *Sûrya-Siddhânta* fixes it as 54" or $\frac{3}{200}$ degrees. (*see Art.* 100a *given in the Addenda sheet.*)

4 The *anomaly* of a planet is its angular distance from its perihelion, or an angle contained between a line drawn from the sun to the planet, called the *radius vector*, and a line drawn from the sun to the perihelion point of its orbit. In the case in point, the earth, after completing its sidereal revolution, has not arrived quite at its perihelion because the apsidal point has shifted slightly eastwards. Hence the year occupied in travelling from the old perihelion to the new perihelion is called the anomalistic year. A planet's *true anomaly* is the actual angle as above whatever may be the variations in the planet's velocity at different periods of its orbit. Its *mean anomaly* is the angle which would be obtained were its motion between perihelion and aphelion uniform in time, and subject to no variation of velocity—in other words the angle described by a uniformly revolving radius vector. The angle between the true and mean anomalies is called the equation of the centre. *True anom. = mean anom. + equation of the centre.*

The equation of the centre is zero at perihelion and aphelion and a maximum midway between them. In the case of the sun its greatest value is nearly 1° 55' for the present, the sun getting alternately that amount ahead of, and behind, the position it would occupy if its motion were uniform. (C. A. Young, *General Astronomy, Edit. of* 1889, *p.* 125.)

Prof. Jacobi's, and our, *a*, *b*, *c* (Table I., cols. 23, 24, 25) give *a* the distance of the moon from the sun, expressed in 10,000ths of the unit of 360°, *b* the moon's mean anomaly, *c* the sun's mean anomaly, the two last expressed in 1000ths of the unit of 360°. **The respective equations of the centre are given in Tables VI. and VII. [R. S.]**

5 "The ecliptic slightly and very slowly shifts its position among the stars, thus altering the latitudes of the stars and the angle between the ecliptic and equator, *i.e.*, the obliquity of the ecliptic. This obliquity is at present about 24' less than it was 2000 years ago, **and it is still decreasing about** half a second a year. It is computed that this diminution will continue for about 15,000 years, reducing **the obliquity to 22 1/6°,** when it will begin to increase. The whole change, according to **Lagrange**, can never exceed about 1° 21' on **each side of the mean" (C. A. Young, *General Astronomy*, p. 128.)**

in A.D. 1900 as 23° 17' 08".03. The various year-lengths for A.D. 1900, as calculated by present standard authorities, are as follow:

| | d. | h. | m. | s. |
|---|---|---|---|---|
| Mean Sidereal solar year | 365 | 6 | 9 | 9.29 |
| Do. Tropical do. | 365 | 5 | 48 | 45.37 |
| Do. Anomalistic do. | 365 | 6 | 13 | 48.61 |

16. *Kalpa. Mahâyuga. Yuga. Julian Period.* A *kalpa* is the greatest Indian division of time. It consists of 1000 *mahâyugas*. A *mahâyuga* is composed of four *yugas* of different lengths, named *Krita*, *Tretâ*, *Dvâpara*, and *Kali*. The Kali-yuga consists of 432,000 solar years. The Dvâpara yuga is double the length of the Kali. The Tretâ-yuga is triple, and the Krita-yuga quadruple of the Kali. A mahâyuga therefore contains ten times the years of a Kali-yuga, viz., 4,320,000. According to Indian tradition a kalpa is one day of Brahman, the god of creation. The Kali-yuga is current at present; and from the beginning of the present kalpa up to the beginning of the present Kali-yuga 4567 times the years of a Kali-yuga have passed. The present Kali-yuga commenced, according to the *Sûrya Siddhânta*, an authoritative Sanskrit work on Hindu astronomy, at midnight on a Thursday corresponding to 17th—18th February, 3102 B.C., old style; by others it is calculated to have commenced on the following sunrise, viz., Friday, 18th February. According to the *Sûrya* and some other *Siddhântas* both the sun and moon were, with reference to their mean longitude, precisely on the beginning point of the zodiacal sign Aries, the Hindu sign Mesha, when the Kali-yuga began.

European chronologists often use for purposes of comparison the 'Julian Period' of 7980 years, beginning Tuesday 1st January, 4713 B.C. The 18th February, 3102 B.C., coincided with the 588,466th day of the Julian Period.

17. *Siddhânta year-measurement.* The length of the year according to different Hindu authorities is as follows:

| Siddhântas. | Hindu reckoning. days. | gh. | pa. | vipa. | pra. vi. | European reckoning. days. | h. | min. | sec. |
|---|---|---|---|---|---|---|---|---|---|
| The Vedânga Jyotisha | 366 | 0 | 0 | 0 | 0 | 366 | 0 | 0 | 0 |
| The Paitâmaha Siddhânta [1] | 365 | 21 | 25 | 0 | 0 | 365 | 8 | 34 | 0 |
| The Romaka " | 365 | 14 | 48 | 0 | 0 | 365 | 5 | 55 | 12 |
| The Paulisa [2] " | 365 | 15 | 30 | 0 | 0 | 365 | 6 | 12 | 0 |
| The original Sûrya Siddhânta | 365 | 15 | 31 | 30 | 0 | 365 | 6 | 12 | 36 |
| The Present Sûrya, Vâsishtha, Śâkalya-Brahma, Romaka & Soma Siddhântas | 365 | 15 | 31 | 31 | 24 | 365 | 6 | 12 | 36.56 |
| The first Ârya Siddhânta [3] (A. D. 499) | 365 | 15 | 31 | 15 | 0 | 365 | 6 | 12 | 30 |
| The Brahma Siddhânta by Brahma-gupta (A. D. 628) | 365 | 15 | 30 | 22 | 30 | 365 | 6 | 12 | 9 |
| The second Arya Siddhânta | 365 | 15 | 31 | 17 | 6 | 365 | 6 | 12 | 30.84 |
| The Parâsara Siddhânta [4] | 365 | 15 | 31 | 18 | 30 | 365 | 6 | 12 | 31.6 |
| Râjamriganka [5] " (A. D. 1042) | 365 | 15 | 31 | 17 | 17.8 | 365 | 6 | 12 | 30.915 |

[1] Generally speaking an astronomical Sanskrit work, called a *Siddhânta*, treats of the subject theoretically. A practical work on astronomy based on a Siddhânta is called in Sanskrit a *Karana*. The *Paitâmaha* and following three *Siddhântas* are not now extant, but are alluded to and described in the *Panchasiddhântikâ*, a *Karana* by Varâhamihira, composed in or about the Saka year 427 (A.D. 505). [S. B. D.]

[2] Two other *Pulisa Siddhântas* were known to Utpala (A.D. 966), a well-known commentator of Varâhamihira. The length of the year in them was the same as that in the original Sûrya Siddhânta. [S. B. D.]

[3] The duration of the year by the First Arya Siddhânta is noted in the interesting chronogram *mukhyah kilomasamâtulah*.
5 1 1 3 5 1 5 6 3
These figures are to be read from right to left: thus—365, 15, 31, 15 in Hindu notation of days, ghatikâs, etc. (I obtained this from Dr Burgess.—R. S.)

[4] The *Parâsara Siddhânta* is not now extant. It is described in the second *Arya Siddhânta*. The date of this latter is not given, but in my opinion it is about A.D. 950. [S. B. D.]

[5] The *Râjamriganka* is a *Karana* by King Bhoja. It is dated in the Saka year 964 expired, A.D. 1042. [S. B. D.]

It will be seen that the duration of the year in all the above works except the first three approximates closely to the anomalistic year; and is a little greater than that of the sidereal year. In some of these works theoretically the year is sidereal; in the case of some of the others it cannot be said definitely what year is meant; while in none is it to be found how the calculations were made. It may, however, be stated roughly that the Hindu year is sidereal for the last 2000 years.

18. The year as given in each of the above works must have been in use somewhere or another in India at some period; but at present, so far as our information goes, the year of only three works is in use, viz., that of the present *Sûrya Siddhânta*, the first *Ârya Siddhânta*, and the *Râjamrigâṅka*.

*The Siddhântas and other astronomical works.*

19. It will not be out of place here to devote some consideration to these various astronomical works; indeed it is almost necessary to do so for a thorough comprehension of the subject.

Many other *Siddhântas* and *Karaṇas* are extant besides those mentioned in the above list. We know of at least thirty such works, and some of them are actually used at the present day in making calculations for preparing almanacks.[1] Many other similar works must, it is safe to suppose, have fallen into oblivion, and that this is so is proved by allusions found in the existing books.

Some of these works merely follow others, but some contain original matter. The Karaṇas give the length of the year, and the motions and places at a given time of the sun, moon, and planets, and their apogees and nodes, according to the standard *Siddhânta*. They often add corrections of their own, necessitated by actual observation, in order to make the calculations agree. Such a correction is termed a *bîja*. Generally, however, the length of the year is not altered, but the motions and places are corrected to meet requirements

As before stated, each of these numerous works, and consequently the year-duration and other elements contained in them, must have been in use somewhere or another and at some period or another in India. At the present time, however, there are only three schools of astronomers known: one is called the *Saura-paksha*, consisting of followers of the present *Sûrya Siddhânta*; another is called the *Ârya-paksha*, and follows the first *Ârya Siddhânta*; and the third is called the *Brahma-paksha*, following the *Râjamrigâṅka*, a work based on Brahmagupta's *Brahma Siddhânta*, with a certain *bîja*. The distinctive feature of each of these schools is that the length of the year accepted in all the works of that school is the same, though with respect to other elements they may possibly disagree between themselves. The name *Râjamrigâṅka* is not now generally known, the work being superseded by others; but the year adopted by the present Brâhma-school is first found, so far as our information goes, in the *Râjamrigâṅka*, and the three schools exist from at least A. D. 1042, the date of that work.

20. It is most important to know what *Siddhântas* or *Karaṇas* were, or are now, regarded as standard authorities, or were, or are, actually used for the calculations of pañchâṅgs (almanacks) during particular periods or in particular tracts of country,[2] for unless this is borne in mind we shall often go wrong when we attempt to convert Indian into European dates. The sketch which follows must not, however, be considered as exhaustive. The original *Sûrya-*

[1] *Karaṇas* and other practical works, containing tables based on one or other of the *Siddhântas*, are used for these calculations. [S. B. D.]

[2] The positions and motions of the sun and moon and their apogees must necessarily be fixed and known for the correct calculation of a tithi, nakshatra, yoga or karaṇa. The length of the year is also an important element, and in the samvatsara is governed by the movement of the planet Jupiter. In the present work we are concerned chiefly with these six elements, viz., the sun, moon, their apogees, the length of the year, and Jupiter. The sketch in the text is given chiefly keeping in view these elements. When one authority differs from another in any of the first five of these six elements the tithi as calculated by one will differ from that derived from another. [S. B. D.]

*Siddhânta* was a standard work in early times, but it was superseded by the present *Sûrya-Siddhânta* at some period not yet known, probably not later than A.D. 1000. The first *Ârya-Siddhânta*, which was composed at Kusumapura (supposed to be Patnâ in Bengal), came into use from A.D. 499.[1] Varâhamihira in his *Panchasiddhântikâ* (A.D. 505) introduced a *bîja* to Jupiter's motion as given in the original *Sûrya-Siddhânta*, but did not take it into account in his rule (*see Art. 62 below*) for calculating a samvatsara. Brahmagupta composed his *Brahma-Siddhânta* in A. D. 628. He was a native of Bhillamâla (the present Bhinmâl), 40 miles to the north-west of the Abu mountains. Lalla, in his work named *Dhi-vriddhida*, introduced a *bîja* to three of the elements of the first *Ârya-Siddhânta*, namely, the moon, her apogee, and Jupiter, *i.e.*, three out of the six elements with which we are concerned. Lalla's place and date are not known, but there is reason to believe that he flourished about A.D. 638. The date and place of the second *Ârya-Siddhânta* are also not known, but the date would appear to have been about A.D. 950. It is alluded to by *Bhâskarâchârya* (A.D. 1150), but does not seem to have been anywhere in use for a long time. The *Râjamrigânka* (A.D. 1042) follows the *Brahma-Siddhânta*,[2] but gives a correction to almost all its mean motions and places, and even to the length of the year. The three schools—Saura, Ârya and Brâhma—seem to have been established from this date if not earlier, and the *Brahma-Siddhânta* in its orginal form must have then dropped out of use. The *Karaṇa-prakâsa*, a work based on the first *Ârya-Siddhânta* as corrected by Lalla's bîja, was composed in A.D. 1092, and is considered an authority even to the present day among many Vaishṇavas of the central parts of Southern India, who are followers of the *Ârya-Siddhânta*. Bhâskarâchârya's works, the *Siddhânta Siromaṇi* (A.D. 1150) and the *Karaṇa-Kutûhala* (A.D. 1183) are the same as the *Râjamrigânka* in the matter of the calculation of a panchâng. The *Vâkkya-Karaṇa*, a work of the Ârya school, seems to have been accepted as the guide for the preparation of solar panchângs in the Tamil and Malayâḷam countries of Southern India from very ancient times, and even to the present day either that or some similar work of the Ârya school is so used. A Karaṇa named *Bhâsvati* was composed in A. D. 1099, its birthplace according to a commentator being Jagannâtha (or Purî) on the east coast. The mean places and motions given in it are from the original *Sûrya-Siddhânta* as corrected by Varâhamihira's bîja,[3] and it was an authority for a time in some parts of Northern India. Vâvilâla Kochchanna, who resided somewhere in Telingaṇa, composed a Karaṇa in 1298 A.D. He was a strict follower of the present *Sûrya-Siddhânta*, and since his day the latter Siddhânta has governed the preparation of all Telugu luni-solar calendars. The *Makaranda*, another Karaṇa, was composed at Benares in A.D. 1478, its author following the present *Sûrya-Siddhânta*, but introducing a bîja. The work is extensively used in Northern India in the present day for panchânga calculations. Bengalis of the present day are followers of the Saura school, while in the western parts of Northern India and in some parts of Gujarât the Brâhma school is followed. The *Graha-lâghava*, a Karaṇa of the Saura school, was composed by Gaṇesa Daivajña of Nandigrâma (Nândgâm), a village to the South of Bombay, in A. D. 1520. The same author also produced the *Bṛihat* and *Laghutithichintâmaṇis* in A. D. 1525, which may be considered as appendices to the *Graha-lâghava*. Gaṇesa adopted the present *Sûrya Siddhânta* determinations for the length of

1 It is not to be understood that as soon as a standard work comes into use its predecessors go out of use from all parts of the country. There is direct evidence to show that the original *Sûrya-Siddhânta* was in use till A. D. 665, the date of the *Khaṇḍakhâdya* of Brahmagupta, though evidently not in all parts of the country. [S. B. D.]

2 Whenever we allude simply to the "*Brahma Siddhânta*" by name, we mean the *Brahma-Siddhânta* of Brahmagupta.

3 Out of the six elements alluded to in note 1 on the last page, only Jupiter has this bîja. The present *Sûrya-Siddhânta* had undoubtedly come into use before the date of the *Bhâsvatî*. [S. B. D.]

the year and the motions and places of the sun and moon and their apogees, with a small correction for the moon's place and the sun's apogee; but he adopted from the *Ârya Siddhânta* as corrected by Lalla the figures relating to the motion and position of Jupiter.

The *Graha-lâghava* and the *Laghutithichintâmaṇi* were used, and are so at the present day, in preparing pañchâṅgs wherever the Mahrathi language was or is spoken, as well as in some parts of Gujarât, in the Kanarese Districts of the Bombay and Madras Presidencies, and in parts of Haidarâbâd, Maisûr, the Berars, and the Central Provinces. Mahratha residents in Northern India and even at Benares follow these works.

21 It may be stated briefly that in the present day the first *Ârya-Siddhânta* is the authority in the Tamil and Malayâlam countries of Southern India;[1] the Brâhma-paksha obtains in parts of Gujarât and in Râjputâna and other western parts of Northern India; while in almost all other parts of India the present *Sûrya-Siddhânta* is the standard authority. Thus it appears that the present *Sûrya-Siddhânta* has been the prevailing authority in India for many centuries past down to the present day, and since this is so, we have chiefly followed it in this work.[2]

The bija as given in the *Makaranda* (A. D. 1478) to be applied to the elements of the *Sûrya-Siddhânta* is generally taken into account by the later followers of the *Sûrya-Siddhânta*, but is not met with in any earlier work so far as our information goes. We have, therefore, introduced it into our tables after A.D. 1500 for all calculations which admit of it. The bija of the *Makaranda* only applies to the moon's apogee and Jupiter, leaving the other four elements unaffected.

### *Further details. Contents of the Pañchâṅga.*

22. *The Indian Zodiac.* The Indian Zodiac is divided, as in Europe, into 12 parts, each of which is called a *râśi* or "sign". Each sign contains 30 degrees, a degree being called an *amśa*. Each amśa is divided into 60 *kalâs* (minutes), and each kalâ into 60 *vikalâs* (seconds). This sexagesimal division of circle measurement is, it will be observed, precisely similar to that in use in Europe.[3]

23. *The Sankrânti.* The point of time when the sun leaves one zodiacal sign and enters another is called a *sankrânti*. The period between one sankrânti and another, or the time required for the sun to pass completely through one sign of the zodiac, is called a *saura mâsa*, or solar month. Twelve solar months make one solar year. The names of the solar months will be found in Table II., Part ii., and Table III., col. 5. A sankrânti on which a solar month commences takes its name from the sign-name of that month. The Mesha sankrânti marks the vernal equinox, the moment of the sun's passing the first point of Aries. The Karka sankrânti, three solar months later, is also called the *dakshiṇâyana* ("southward-going") *sankrânti*; it is the point of the summer solstice, and marks the moment when the sun turns southward. The Tulâ sankrânti, three solar months later, marks the autumnal equinox, or the moment of the sun's passing the first point of Libra. The Makara sankrânti, three solar months later still, is also called the *uttarâyana sankrânti* ("northward-going"). It is the other solstitial point, the point or moment when the sun turns northward. When we speak of "sankrântis" in this volume we refer always to the *nirayana sankrântis*, *i.e.*, the moments of the sun's entering the zodiacal signs, as calculated in sidereal longitude—longitude measured from the fixed point in Aries—taking no account of the annual precession of the equinoxes—(*nirayana* = "without movement", excluding the precession of the solstitial—*ayana*—points). But there is also in Hindu chronology the *sâyana sankrânti* (*sa-ayana* = "with

[1] It is probable that the first *Ârya-Siddhânta* was the standard authority for South Indian solar reckoning from the earliest times. In Bengal the *Sûrya-Siddhânta* is the authority since about A. D. 1100, but in earlier times the first *Ârya-Siddhânta* was apparently the standard. [S. B. D.]

[2] When we allude simply to the *Sûrya* or *Ârya Siddhânta*, it must be borne in mind that we mean the *Present Sûrya* and the *First Ârya-Siddhântas*.

[3] See note 1, p. 2 above. [R. S.]

movement", including the movement of the *ayana* points, *i.e.*, a saṅkrânti calculated according to tropical longitude—longitude measured from the vernal equinox, the precession being taken into account. According to the present Sûrya-Siddhânta the sidereal coincided with the tropical signs in K. Y. 3600 expired, Śaka 421 expired, and the annual precession is 54". By almost all other authorities the coincidence took place in K. Y. 3623 expired, Śaka 444 expired, and the annual precession is (1') one minute. (The *Siddhânta Śiromaṇi*, however, fixes this coincidence as in K. Y. 3628). Taking either year as a base, the difference in years between it and the given year, multiplied by the total amount of annual precession, will shew the longitudinal distance by which, in the given year, the first point of the tropical (*sâyana*) sign precedes the first point of the sidereal (*nirayana*) sign. Professor Jacobi (*Epig. Ind., Vol. I, p. 422, Art. 39*) points out that a calculation should be made "whenever a date coupled with a sankrânti does not come out correct in all particulars. For it is possible that a *sâyana* sankrânti may be intended, since these sankrântis too are suspicious moments." We have, however, reason to believe that sâyana sankrântis have not been in practical use for the last 1600 years or more. Dates may be tested according to the rule given in Art. 160 (*a*).

It will be seen from cols. 8 to 13 of Table II., Part ii., that there are two distinct sets of names given to the solar months. One set is the set of zodiac-month-names ("Mesha" etc.), the other has the names of the lunar months. The zodiac sign-names of months evidently belong to a later date than the others, since it is known that the names of the zodiacal signs themselves came into use in India later than the lunar names, "Chaitra" and the rest.[1] Before sign-names came into use the solar months must have been named after the names of the lunar months, and we find that they are so named in Bengal and in the Tamil country at the present day.[2]

24. *Length of months.* It has been already pointed out that, owing to the fact that the apparent motion of the sun and moon is not always the same, the lengths of the lunar and solar months vary. We give here the lengths of the solar months according to the *Sûrya* and *Ârya Siddhântas*.

| Serial No. | NAME OF THE MONTH. | | | DURATION OF EACH MONTH. | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | By the *Ârya-Siddhânta.* | | | | | | | By the *Sûrya-Siddhânta.* | | | | | | |
| | Sign-name. | Tamil name. | Bengâli name. | days | gh. | pa. | days | hrs. | min. | sec. | days | gh. | pa. | days | hrs. | min. | sec. |
| 1 | Mesha | Śittirai (Chittirai) | Vaiśâkha | 30 | 55 | 30 | 30 | 22 | 12 | 0 | 30 | 56 | 7 | 30 | 22 | 26 | 48 |
| 2 | Vṛishabha | Vaigâsi, or Vaiyâsi | Jyeshṭha | 31 | 24 | 4 | 31 | 9 | 37 | 36 | 31 | 25 | 13 | 31 | 10 | 5 | 12 |
| 3 | Mithuna | Âni | Âshâḍha | 31 | 36 | 26 | 31 | 14 | 34 | 24 | 31 | 38 | 41 | 31 | 15 | 28 | 24 |
| 4 | Karka | Âḍi | Śrâvaṇa | 31 | 28 | 4 | 31 | 11 | 13 | 36 | 31 | 28 | 31 | 31 | 11 | 24 | 24 |
| 5 | Siṁha | Âvaṇi | Bhâdrapada | 31 | 2 | 5 | 31 | 0 | 50 | 0 | 31 | 1 | 7 | 31 | 0 | 26 | 48 |
| 6 | Kanyâ | Puraṭṭâśi, or Puraṭṭâsi | Âśvina | 30 | 27 | 24 | 30 | 10 | 57 | 36 | 30 | 26 | 29 | 30 | 10 | 35 | 36 |
| 7 | Tulâ | Aippasi, or Arppisi, or Appisi | Kârttika | 29 | 54 | 12 | 29 | 21 | 40 | 48 | 29 | 53 | 56 | 29 | 21 | 26 | 24 |
| 8 | Vṛischika | Kârttigai | Mârgaśîrsha | 29 | 30 | 31 | 29 | 12 | 12 | 24 | 29 | 29 | 25 | 29 | 11 | 46 | 0 |
| 9 | Dhanus | Mârgaṛi | Pausha | 29 | 21 | 2 | 29 | 8 | 24 | 48 | 29 | 19 | 4 | 29 | 7 | 37 | 36 |
| 10 | Makara | Tai | Mâgha | 29 | 27 | 24 | 29 | 10 | 57 | 36 | 29 | 28 | 33 | 29 | 10 | 45 | 12 |
| 11 | Kumbha | Mâśi | Phâlguna | 29 | 48 | 30 | 29 | 19 | 24 | 0 | 29 | 49 | 14 | 29 | 19 | 41 | 12 |
| 12 | Mîna | Panguni | Chaitra | 30 | 20 | 19½ | 30 | 8 | 7 | 48 | 30 | 21 | 12.52 | 30 | 8 | 29 | 9.56 |
| | | | | 365 | 15 | 31½ | 365 | 6 | 12 | 36 | 365 | 15 | 31.52 | 365 | 6 | 12 | 36.56 |

[1] My present opinion is that the zodiacal-sign-names, *Mesha*, etc., began to be used in India between 700 B. C. and 300 B. C., not earlier than the former or later than the latter. [S. B. D.]

[2] It will be seen that the Bengal names differ from the Tamil ones. The same solar month *Mesha*, the first of the year, is

For calculation of the length by the *Sûrya-Siddhânta* the longitude of the sun's apogee is taken as 77° 16', which was its value in A. D. 1137, a date about the middle of our Tables. Even if its value at our extreme dates, *i.e.*, either in A. D. 300 or 1900, were taken the lengths would be altered by only one *pala* at most. By the *Ârya-Siddhânta* the sun's apogee is taken as constantly at 78°.[1]

The average (mean) length in days of solar and lunar months, and of a lunar year is as follows:

| | *Sûrya-Siddhânta* | *Modern science* |
|---|---|---|
| Solar month ($\frac{1}{12}$ of a sidereal year) | 30.438229707 | 30.438030. |
| Lunar month . . . . . . . . . | 29.530587946 | 29.530588. |
| Lunar year (12 lunations) . . . . | 354.36705535 | 354.367056. |

25. *Adhika mâsas. Calendar used.* A period of twelve lunar months falls short of the solar year by about eleven days, and the Hindus, though they use lunar months, have not disregarded this fact; but in order to bring their year as nearly as possible into accordance with the solar year and the cycle of the seasons they add a lunar month to the lunar year at certain intervals. Such a month is called an *adhika* or intercalated month. The Indian year is thus either solar or luni-solar. The Muhammadan year of the Hijra is purely lunar, consisting of twelve lunar months, and its initial date therefore recedes about eleven days in each year. In luni-solar calculations the periods used are tithis and lunar months, with intercalated and suppressed months whenever necessary. In solar reckoning solar days and solar months are alone used. In all parts of India luni-solar reckoning is used for most religious purposes, but solar reckoning is used where it is prescribed by the religious authorities. For practical civil purposes solar reckoning is used in Bengal and in the Tamil and Malayâḷam countries of the Madras Presidency; in all other parts of the country luni-solar reckoning is adopted.

26. *True and mean sankrântis. Sodhya.* When the sun enters one of the signs of the zodiac, as calculated by his mean motion, such an entrance is called a mean saṅkrânti; when he enters it as calculated by his apparent or true motion, such a moment is his apparent or true[‡] saṅkrânti. At the present day true saṅkrântis are used for religious as well as for

called *Vaiśâkha* in Bengal and *Sittirai (Chaitra)* in the Tamil country, Vaiśâkha being the second month in the south. To avoid confusion, therefore, we use only the sign-names (*Mesha, etc.*) in framing our rules.

[1] The lengths of months by the *Ârya-Siddhânta* here given are somewhat different from those given by Warren. But Warren seems to have taken the longitude of the sun's apogee by the *Sûrya-Siddhânta* in calculating the duration of months by the *Ârya-Siddhânta*, which is wrong. He seems also to have taken into account the *chara*.* (*See his Kâla Sankalita, p. 11, art. 3, p. 22, explanation of Table III, line 4, and p. 3 of the Tables*). He has used the *ayanâmsa* (the uniformly increasing arc between the point of the vernal equinox each year and the fixed point in Aries) which is required for finding the *chara* in calculating the lengths of months. The *chara* is not the same at the beginning of any given solar month for all places or for all years. Hence it is wrong to use it for general rules and tables. The inaccuracy of Warren's lengths of solar months according to the *Sûrya-Siddhânta* requires no elaborate proof, for they are practically the same as those given by him according to the *Ârya-Siddhânta*, and that this cannot be the case is self-evident to all who have any experience of the two *Siddhântas*. [S. B. D.]

* The *chara*.—"The time of rising of a heavenly body is assumed to take place six hours before it comes to the meridian. Actually this is not the case for any locality not on the equator, and the *chara* is the correction required in consequence, *i.e.*, the excess or defect from six hours of the time between rising and reaching the meridian. The name is also applied to the celestial arc described in this time."

‡ The Sanskrit word for "mean" is *madhyama*, and that for 'true' or 'apparent' is *spashṭa*. The words '*madhyama*' and '*spashṭa*' are applied to many varieties of time and space, as, for instance, *gati* (motion), *bhôga* (longitude), *sankrânti*, *mâna* (measure or reckoning) and *kâla* (time). In the English Nautical Almanac the word "apparent" is used to cover almost all cases where the Sanskrit word *spashṭa* would be applied, the word 'true' being sometimes, but rarely, used. "Apparent," therefore, is the best word to use in my opinion, and we have adopted it prominently, in spite of the fact that previous writers on Hindu Astronomy have chiefly used the word "true." There is in fact a little difference in the meaning of the phrases "apparent" and "true," but it is almost unknown to Indian Astronomy, and we have therefore used the two words as synonyms. [S. B. D.]

civil purposes. In the present position of the sun's apogee, the mean Mesha saṅkrânti takes place after the true saṅkrânti, the difference being two days and some ghaṭikâs. This difference is called the *śodhya*. It differs with different *Siddhântas*, and is not always the same even by the same authority. We have taken it as 2 d. 10 gh. 14 p. 30 vipa. by the *Sûrya-Siddhânta*, and 2 d. 8 gh. 51 p. 15 vipa. by the *Ârya-Siddhânta*. The corresponding notion in modern European Astronomy is the equation of time. The śodhya is the number of days required by the sun to catch up the equation of time at the vernal equinox.

27. It must be remembered that whenever we use the word "saṅkrânti" alone, (e.g., "the Mesha-saṅkrânti") the apparent and not the mean nirayana saṅkrânti is meant.

28. *The beginning of a solar month.* Astronomically a solar month may begin, that is a saṅkrânti may occur, at any moment of a day or night; but for practical purposes it would be inconvenient to begin the month at irregular times of the day. Suppose, for example, that a Makara-saṅkrânti occurred 6 hours 5 minutes after sunrise on a certain day, and that two written agreements were passed between two parties, one at 5 hours and another at 7 hours after sunrise. If the month Makara were considered to have commenced at the exact moment of the Makara-saṅkrânti, we should have to record that the first agreement was passed on the last day of the month Dhanus, and the second on the first day of Makara, whereas in fact both were executed on the same civil day. To avoid such confusion, the Hindus always treat the beginning of the solar month as occurring, civilly, at sunrise. Hence a variation in practice.

(1) (*a*) In Bengal, when a saṅkrânti takes place between sunrise and midnight of a civil day the solar month begins on the following day, and when it occurs after midnight the month begins on the next following, or third, day. If, for example, a saṅkrânti occurs between sunrise and midnight of a Friday, the month begins at sunrise on the next day, Saturday; but if it takes place after midnight of Friday[1] the month begins at sunrise on the following Sunday. This may be termed *the Bengal Rule*. (*b*) In Orissa the solar month of the Amli and Vilayati eras begins civilly on the same day as the saṅkrânti, whether this takes place before midnight or not. This we call *the Orissa Rule*.

(2) In Southern India there are two rules. (*a*) One is that when a saṅkrânti takes place after sunrise and before sunset the month begins on the same day, while if it takes place after sunset the month begins on the following day; if, for example, a saṅkrânti occurs on a Friday between sunrise and sunset the month begins on the same day, Friday, but if it takes place at any moment of Friday night after sunset the month begins on Saturday.[2] (*b*) By another rule, the day between sunrise and sunset being divided into five parts, if a saṅkrânti takes place within the first three of them the month begins on the same day, otherwise it begins on the following day. Suppose, for example, that a saṅkrânti occurred on a Friday, seven hours after sunrise, and that the length of that day was 12 hours and 30 minutes; then its fifth part was 2 hours 30 minutes, and three of these parts are equal to 7 hours 30 minutes. As the saṅkrânti took place within the first three parts, the month began on the same day, Friday; but if the saṅkrânti had occurred 8 hours after sunrise the month would have begun on Saturday. The latter (*b*) rule is observed in the North and South Malayâlam country, and the former (*a*) in other parts of Southern India where the solar reckoning is used, viz., in the Tamil and Tinnevelly countries.[3] We call *a. the Tamil Rule; b. the Malabar Rule.*

[1] Remember that the week-day is counted from sunrise to sunrise.

[2] Brown's *Ephemeris* follows this rule throughout in fixing the date corresponding to 1st Mesha, and consequently his solar dates are often wrong by one day for those tracts where the 2 b rule is in use.

[3] I deduced the Bengal rule from a Calcutta Pañchâng for Śaka 1776 (A.D. 1854—55) in my possession. Afterwards it was

29. *Pañchâṅgs.* Before proceeding we revert to the five principal articles of the pañchâṅg.

There are 30 *tithis* in a lunar month, 15 to each fortnight. The latter are generally denoted by the ordinary numerals in Sanskrit, and these are used for the fifteen tithis of each fortnight. Some tithis are, however, often called by special names. In pañchâṅgs the tithis are generally particularized by their appropriate numerals, but sometimes by letters. The Sanskrit names are here given. [1]

| Tithis | Sanskrit Names. | Vulgar Names. | Tithis | Sanskrit Names. | Vulgar Names. |
|---|---|---|---|---|---|
| 1 | Pratipad, Pratipadâ, Prathamâ | Pâḍvâ, Pâḍyami | 9 | Navamî | |
| 2 | Dvitîyâ | Bîja, Vidiya | 10 | Daśamî | |
| 3 | Tritîyâ | Tîja, Tadiya | 11 | Ekâdaśî | |
| 4 | Chaturthî | Chauth, Chauthi | 12 | Dvâdaśî | Bâras |
| 5 | Pañchamî | | 13 | Trayôdaśî | Teras |
| 6 | Shashṭhî | Sath | 14 | Chaturdaśî | |
| 7 | Saptamî | | 15 | Pûrṇimâ, Paurṇimâ, Pûrṇamâsî, Pañchadaśî | Punava, Punnamî |
| 8 | Ashtamî | | 30 | Amâvâsyâ, Darśa, Pañchadaśî | |

The numeral 30 is generally applied to the *amâvâsyâ* (new moon day) in pañchâṅgs, even in Northern India where according to the pûrṇimânta system the dark fortnight is the first fortnight of the month and the month ends with the moment of full moon, the *amâvâsyâ* being really the 15th tithi.

30. That our readers may understand clearly how a Hindu pañchâṅg is prepared and what information it contains, we append an extract from an actual pañchâṅg for Saka 1816, expired, A. D. 1894–95, published at Poona in the Bombay Presidency. [2]

corroborated by information kindly sent to me from Howrah by Mr. G. A. Grierson through Dr. Fleet. It was also amply corroborated by a set of Bengal Chronological Tables for A.D. 1882 published under the authority of the Calcutta High Court, a copy of which was sent to me by Mr. Sewell. I owe the Orissa Rule to the Chronological Tables published by Girishchandra Tarkâlankar, who follows the Orissa Court Tables with regard to the Amli and Vilayati years in Orissa. Dr. J. Burgess, in a note in Mr. Krishnasvâmi Naidu's "*South Indian Chronological Tables*" edited by Mr. Sewell, gives the 2 (*a*) Rule as in use in the North Malayâlam country, but I do not know what his authority is. I ascertained from Tamil and Tinnevelly pañchâṅgs that the 2 (*a*) rule is in use there, and the fact is corroborated by Warren's *Kâla Sankalita*. I ascertained also from some South Malayâlam pañchâṅgs published at Cochin and Trevandrum and from a North Malayâlam pañchâṅg published at Calicut that the 2 (*b*) rule is followed there. [S. B. D.]

Notwithstanding all this I have no certain guarantee that these are the only rules, or that they are invariably followed in the tracts mentioned. Thus I find from a Tamil solar pañchâṅg for Saka 1815 current, published at Madras, and from a Telugu luni-solar pañchâṅg for Saka 1109 expired, also published at Madras, in which the solar months also are given, that the rule observed is that "when a saṅkrânti occurs between sunrise and midnight the month begins on the same day, otherwise on the following day", thus differing from all the four rules given above. This varying fifth rule again is followed for all solar months of the Vilayati year as given in the above-mentioned Bengal Chronological Tables for 1882, and by its use the month regularly begins one day in advance of the Bengâli month. I find a sixth rule in some Bombay and Benares lunar pañchâṅgs, viz., that at whatever time the saṅkrânti may occur, the month begins on the next day; but this is not found in any solar pañchâṅg. The rules may be further classified as (1. *a*) *the midnight rule* (Bengal), (1. *b*) *any time rule* (Orissa), (2. *a*) *the sunset rule* (Tamil), (2. *b*) *the afternoon rule* (Malabar). The fifth rule is a variety of the midnight rule, and the sixth a variety of the any time rule. I cannot say for how many years past the rules now in use in the several provinces have been in force and effect.

An inscription at Kaṇṇanûr, a village 5 miles north of Srîrangam near Trichinopoly (*see Epigraph. Indic., vol. III., p. 10, date No. V., note 8, and p. 8*), is dated Tuesday the thirteenth tithi of the bright fortnight of Srâvaṇa in the year Prajâpati, which corresponded with the 24th day of the (solar) month Âḍi (Karka). From other sources the year of this date is known to be A. D. 1271; and on carefully calculating I find that the day corresponds with the 21st July, and that the Karka saṅkrânti took place, by the *Ârya-Siddhânta*, on the 27th June, Saturday, shortly before midnight. From this it follows that the month Âḍi began civilly on the 28th June, and that one or the other of the two rules at present in use in Southern India was in use in Trichinopoly in A.D. 1271. [S. B. D.]

1 We cannot enumerate the vulgar or popular names which obtain in all parts of India, and it is not necessary that we should do so.

2 This is an ordinary pañchâṅg in daily use. It was prepared by myself from Gaṇesa Daivajña's *Grahalâghava* and *Laghutithichintâmaṇi*. [S. B. D.]

*Saka 1816 expired (1817 current) (A. D. 1894) amânta Bhâdrapada, sukla-paksha. Solar month: Simha*

| Tithi | Vâra | gh. | pa. | Nakshatra | gh. | pa. | Yoga. | gh. | pa. | Karana | gh. | pa. | Moon's place* | Length of day gh. | pa. | Solar date. | Muhammadan date. | Date A. D. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Fri. | 43 | 59 | Pûrva Phalguni | 40 | 16 | Siddha | 31 | 22 | Kiṁstughna | 16 | 30 | Simha 14 | 30 | 59 | 16 | 29 | 31 |
| 2 | Sat. | 39 | 47 | Uttara Phalguni | 37 | 57 | Sâdhya | 25 | 23 | Bâlava | 11 | 53 | Kanyâ | 30 | 57 | 17 | 30 | 1 |
| 3 | Sun | 36 | 31 | Hasta | 36 | 20 | Śubha | 19 | 31 | Taitila | 8 | 9 | Kanyâ | 30 | 54 | 18 | 1 | 2 |
| 4 | Mon | 34 | 28 | Chitrâ | 36 | 7 | Śukla | 14 | 50 | Vaṇij | 5 | 27 | Kanyâ 6 | 30 | 52 | 19 | 2 | 3 |
| 5 | Tues. | 33 | 26 | Svâti | 36 | 52 | Brahman | 11 | 7 | Bava | 3 | 54 | Tulâ | 30 | 49 | 20 | 3 | 4 |
| 6 | Wed. | 33 | 56 | Viśâkhâ | 38 | 58 | Aindra | 8 | 24 | Kaulava | 3 | 42 | Tulâ 23 | 30 | 46 | 21 | 4 | 5 |
| 7 | Thurs | 35 | 29 | Anurâdhâ | 42 | 19 | Vaidhṛiti | 6 | 36 | Gara | 4 | 44 | Vṛiśchi | 30 | 46 | 22 | 5 | 6 |
| 8 | Fri | 38 | 16 | Jyeshṭhâ | 46 | 48 | Vishkambha | 5 | 40 | Vishṭi | 6 | 53 | Vṛiś. 47 | 30 | 41 | 23 | 6 | 7 |
| 9 | Sat. | 42 | 9 | Mûla | 52 | 13 | Prîti | 6 | 2 | Bâlava | 10 | 19 | Dhanus | 30 | 38 | 24 | 7 | 8 |
| 10 | Sun | 46 | 48 | Pûrva Ashâḍhâ | 58 | 11 | Âyushmat | 6 | 53 | Taitila | 14 | 28 | Dhanus | 30 | 36 | 25 | 8 | 9 |
| 11 | Mon. | 51 | 14 | Uttara Ashâḍhâ | 60 | 0 | Saubhâgya | 8 | 1 | Vaṇij | 19 | 16 | Dhan. 13 | 30 | 33 | 26 | 9 | 10 |
| 12 | Tues. | 56 | 44 | Uttara Ashâḍhâ | 4 | 35 | Śobhana | 9 | 20 | Bava | 24 | 14 | Makara | 30 | 30 | 27 | 10 | 11 |
| 13 | Wed. | 60 | 0 | Śravaṇa | 10 | 59 | Atigaṇḍa | 10 | 58 | Kaulava | 29 | 3 | Maka. 44 | 30 | 28 | 28 | 11 | 12 |
| 13 | Thurs | 1 | 23 | Dhanishṭhâ | 16 | 45 | Sukarman | 11 | 54 | Taitila | 1 | 23 | Kumbha | 30 | 25 | 29 | 12 | 13 |
| 14 | Fri | 5 | 18 | Śatabhishaj | 21 | 59 | Dhṛiti | 12 | 26 | Vaṇij | 5 | 18 | Kumbha | 30 | 22 | 30 | 13 | 14 |
| 15 | Sat | 8 | 11 | Pûrva Bhadra. | 26 | 4 | Śûla | 12 | 7 | Bava | 8 | 11 | Kum. 10 | 30 | 20 | 31 | 14 | 15 |

*Amânta Bhâdrapada krishṇapaksha.*

| Tithi | Vâra | gh. | pa. | Nakshatra | gh. | pa. | Yoga. | gh. | pa. | Karana | gh. | pa. | Moon's place* | Length of day gh. | pa. | Solar date. | Muhammadan date. | Date A. D. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Sun. | 9 | 50 | Uttara Bhadra. | 28 | 58 | Gaṇḍa | 10 | 45 | Kaulava | 9 | 50 | Mîna | 30 | 17 | 1 | 15 | 16 |
| 2 | Mon. | 10 | 30 | Revatî | 30 | 46 | Vṛiddhi | 8 | 30 | Gara | 10 | 30 | Mîna 31 | 30 | 15 | 2 | 16 | 17 |
| 3 | Tues. | 9 | 35 | Aśvinî | 31 | 9 | Dhruva | 5 | 10 | Vishṭi | 9 | 35 | Mesha | 30 | 12 | 3 | 17 | 18 |
| 4 | Wed. | 7 | 26 | Bharaṇî | 30 | 27 | Vyâghâta | 0<br>54 | 50<br>52 | Bâlava | 7 | 26 | Me. 45 | 30 | 10 | 4 | 18 | 19 |
| 5 | Thurs | 4 | 19 | Kṛittikâ | 28 | 34 | Vajra | 49 | 43 | Taitila | 4 | 19 | Vṛisha | 30 | 7 | 5 | 19 | 20 |
| 6 | Fri. | 0<br>55 | 16<br>18 | Rohiṇî | 25 | 59 | Siddhi | 43 | 1 | Vaṇij | 0 | 16 | Vṛi. 54 | 30 | 5 | 6 | 20 | 21 |
| 8 | Sat. | 49 | 55 | Mṛigaśiras | 22 | 43 | Vyatipâta | 35 | 56 | Bâlava | 22 | 45 | Mithuna | 30 | 2 | 7 | 21 | 22 |
| 9 | Sun | 44 | 9 | Ârdrâ | 18 | 57 | Varîyas | 28 | 28 | Taitila | 16 | 2 | Mithuna | 30 | 0 | 8 | 22 | 23 |
| 10 | Mon | 38 | 9 | Punarvasu | 14 | 55 | Parigha | 20 | 45 | Vaṇij | 11 | 9 | Mithu. 1 | 29 | 57 | 9 | 23 | 24 |
| 11 | Tues. | 32 | 9 | Pushya | 10 | 47 | Śiva | 13 | 2 | Bava | 5 | 9 | Karka | 29 | 55 | 10 | 24 | 25 |
| 12 | Wed | 26 | 17 | Aśleshâ | 6 | 46 | Siddha | 5<br>52 | 24<br>31 | Taitila | 26 | 17 | Kar. 7 | 29 | 52 | 11 | 25 | 26 |
| 13 | Thurs. | 20 | 45 | Maghâ | 3<br>58 | 4<br>51 | Sâdhya | 51 | 4 | Vaṇij | 20 | 45 | Siṁha | 29 | 49 | 12 | 26 | 27 |
| 14 | Fri | 15 | 48 | Uttara Phalguni | 57 | 25 | Śukla | 44 | 35 | Śakuni | 15 | 48 | Siṁ. 14 | 29 | 47 | 13 | 27 | 28 |
| 30 | Sat. | 11 | 40 | Hasta | 55 | 38 | Brahman | 38 | 40 | Nâga | 11 | 40 | Kanyâ | 29 | 44 | 14 | 28 | 29 |

* Where no numbers are inserted in this column it must be understood that the moon was in the sign during the whole day.

*and Kanyâ; Muhammadan months Ṣafar and Rabi-ul-awwal. English months August and September.*

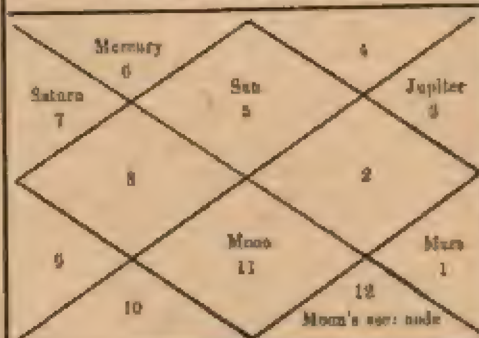
| Date & Tithi | OTHER PARTICULARS |
|---|---|
| 31 | |
| 1 | Chandra-darśana (moon's heliacal rising). September begins. |
| 2 | Amṛita Siddhiyoga 36.29.* Haritâlikâ, Manvâdi; Varâhajayantî, Vaidhṛiti 35.10 to 44.42. Rabi-ul-awwal begins. |
| 3 | Ganesha chaturthî. |
| 4 | Rishipañchamî. |
| 5 | Amṛita Siddhiyoga after 39. Venus enters Leo 45.44. |
| 6 | Gauryâvâhana. |
| 7 | Gaurî pûjâ. Dûrvâ ashṭamî. |
| 8 | Gaurî visarjana. Adukkha navamî. |
| 9 | |
| 10 | Padmâ Ekâdaśî. Mṛityu-yoga 60. Mercury enters Virgo 14.5. |
| 11 | Vâmana dvâdaśî. |
| 12 | Pradôsha. Sun enters Uttara Phalgunî 8.26. |
| 13 | |
| 14 | Anantachaturdaśî. Mars retrograde. |
| 15 | Proshthap. Pûrni: Sun enters Virgo 33.42. |

Positions of Planets at sunrise Śukla 15th Saturday.

| | | Sun. | Mars. | Mercury. | Jupiter. | Venus. | Saturn. | Moon's node. |
|---|---|---|---|---|---|---|---|---|
| Signs. | | 4 | 0 | 5 | 2 | 4 | 6 | 11 |
| Degrees. | | 29 | 10 | 8 | 12 | 12 | 3 | 9 |
| Minutes. | | 27 | 26 | 37 | 35 | 19 | 45 | 14 |
| Seconds. | | 9 | 2 | 22 | 7 | 44 | 43 | 7 |
| Rate of daily motion | mins. | 58 | 5 | 106 | 7 | 73 | 8 | 3 |
| | secs. | 30 | 6 retro | 20 | 54 | 44 | 15 | 11 |

Ahargaṇa 34—227.

Horoscope for the above time.




*(Pûrṇimanta Âśvina krishṇapaksha.)*

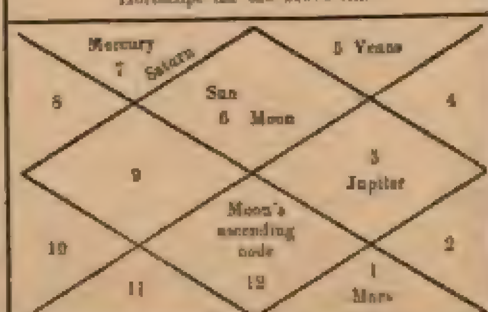
| | |
|---|---|
| 16 | Vyatipâta † from 7 to 16.32. |
| 17 | |
| 18 | Sankashṭî chaturthî. |
| 19 | |
| 20 | |
| 21 | Bhadrâ (Vishṭi) ends at 27.55 |
| 22 | |
| 23 | Avidhavâ navamî. |
| 24 | Heliacal rising of Mercury. |
| 25 | Indirâ ekâdaśî. Sun enters Hasta 46.37 |
| 26 | Pradôsha. |
| 27 | Śivarâtri. Mercury in Libra 29.18. |
| 28 | Pitṛi-amâvâsyâ. Vaidhṛiti 20.47 to 30.21. |
| 29 | Solar eclipse. Mṛityuyoga 55.32. Amâvâsyâ. |

Positions of Planets at sunrise Amâvâsyâ, Saturday.

| | | Sun. | Mars. | Mercury. | Jupiter. | Venus. | Saturn. | Moon's node. |
|---|---|---|---|---|---|---|---|---|
| Signs. | | 5 | 0 | 6 | 2 | 4 | 6 | 11 |
| Degrees. | | 13 | 9 | 2 | 13 | 28 | 5 | 8 |
| Minutes. | | 10 | 13 | 27 | 40 | 31 | 17 | 31 |
| Seconds. | | 7 | 30 | 1 | 4 | 4 | 7 | 35 |
| Rate of daily motion | mins. | 59 | 8 | 95 | 5 | 73 | 7 | 3 |
| | secs. | 1 | 4 retro | 56 | 54 | 44 | 2 | 11 |

Ahargaṇa 34—241.

Horoscope for the above time.




* These figures show ghaṭikâs and palas. † This is the name of a peculiar yoga, the declinations of sun and moon being then identical.

The above extract is for the amânta month Bhâdrapada or August 31st to September 29th, 1894. The month is divided into its two fortnights. The uppermost horizontal column shews that the first tithi, "pratipadâ", was current at sunrise on Friday, and that it ended at 43 gh. 59 p. after sunrise. The moon was 12 degrees to the east of the sun at that moment, and after that the second tithi, "dvitîyâ", commenced. The nakshatra Pûrva-Phalguni ended and Uttara-Phalguni commenced at 40 gh. 16 p. after sunrise. The yoga Siddha ended, and Sâdhya began, at 31 gh. 22 p. after sunrise; and the karaṇa Kiṁstughna ended, and Bava began, at 16 gh. 30 p. after sunrise. The moon was in the sign Siṁha up to 15 gh. after sunrise and then entered the sign Kanyâ. The length of the day was 30 gh. 59 pa. (and consequently the length of the night was 29 gh. 1 pa.). The solar day was the 16th of Siṁha.[1] The Muhammadan day was the 29th of Ṣafar, and the European day was the 31st of August. This will explain the bulk of the table and the manner of using it.

Under the heading "other particulars" certain festival days, and some other information useful for religious and other purposes, are given. To the right, read vertically, are given the places of the sun and the principal planets at sunrise of the last day of each fortnight in signs degrees, minutes, and seconds, with their daily motions in minutes and seconds. Thus the figures under "sun" shew that the sun had, up to the moment in question, travelled through 4 signs, 29 degrees, 27 minutes, and 9 seconds; *i.e.*, had completed 4 signs and stood in the 5th, Siṁha,—had completed 29 degrees and stood in the 30th, and so on; and that the rate of his daily motion for that moment was 58 minutes and 30 seconds. Below are shown the same in signs in the horoscope. The *ahargaṇa*, here 34—227, means that since the epoch of the *Grahalâghava*,[2] *i.e.*, sunrise on amânta Phâlguna kṛishṇa 30th of Śaka 1441 expired, or Monday 19th March, A.D. 1520, 34 cycles of 4016 days each, and 227 days, had elapsed at sunrise on Saturday the 15th of the bright half of Bhâdrapada. The horoscope entries are almost always given in pañchâṅgs as they are considered excessively important by the Hindus.

31. *Tithis and solar days.* Solar or civil days are always named after the week-days, and where solar reckoning is in use are also counted by numbers, *e.g.*, the 1st, 2nd, etc., of a named solar month. But where solar reckoning does not prevail they bear the names and numerals of the corresponding tithis. The tithis, however, beginning as they do at any hour of the day, do not exactly coincide with solar days, and this gives rise to some little difficulty. The general rule for civil purposes, as well as for some ordinary religious purposes for which no particular time of day happens to be prescribed, is that the tithi current at sunrise of the solar day gives its name and numeral to that day, and is coupled with its week-day. Thus *Bhâdrapada śukla chaturdaśî Śukravâra* (Friday the 14th of the first or bright fortnight of Bhâdrapada) is that civil day at whose sunrise the tithi called the 14th śukla is current, and its week-day is Friday. Suppose a written agreement to have been executed between two parties, or an ordinary religious act to have been performed, at noon on that Friday at whose sunrise Bhâdrapada Sukla chaturdaśî of Saka 1816 expired was current, and which ended *(see the table)* 5 gh. 18 p., (about 2 h. 7 m.) after sunrise, or at about 8.7 a.m. Then these two acts were actually done after the chaturdaśî had ended and the pûrṇimâ was current, but they would be generally noted as having been done on Friday śukla chaturdaśî. It is, however, permissible, though such instances would be

[1] Solar days are not given in Bombay pañchâṅgs, but I have entered them here to complete the calendar. Some entries actually printed in the pañchâṅg are not very useful and are consequently omitted in the extract. [S. B. D.]

[2] The sum total of days that have elapsed since any other standard epoch is also called the *ahargaṇa*. For instance, the *ahargaṇa* from the beginning of the present kaliyuga is in constant use. The word means "collection of days."

rare, to state the date of these actions as "Friday pûrṇimâ:" and sometimes for religious purposes the date would be expressed as "chaturdaśî yukta pûrṇimâ" (the 14th joined with the pûrṇimâ). Where, however, successive regular dating is kept up, as, for instance, in daily transactions and accounts, a civil day can only bear the name of the tithi current at its sunrise.

Some religious ceremonies are ordered to be performed on stated tithis and at fixed times of the day. For example, the worship of the god Gaṇeśa is directed to take place on the Bhâdrapada śukla chaturthî during the third part *(madhyâhna)* of the five parts of the day. A śrâddha, a ceremony in honour of the *pitṛis* (manes), must be performed during the 4th *(aparâhṇa)* of these five periods. Take the case of a Brâhmaṇa, whose father is dead, and who has to perform a srâddha on every amâvâsyâ. In the month covered by our extract above the amâvâsyâ is current at sunrise on Saturday. It expired at 11 gh. 40 p. after sunrise on Saturday, or at about 10.40 a.m. Now the aparâhṇa period of that Saturday began, of course, later than that hour, and so the amâvâsyâ of this Bhâdrapada was current during the aparâhṇa, not of Saturday, but of the previous day, Friday. The śrâddha ordered to be performed on the amâvâsyâ must be performed, not on Saturday, but on Friday in this case. Again, suppose a member of the family to have died on this same Friday before the end of the tithi kṛishṇa chaturdaśî, and another on the same day but after the end of the tithi. A śrâddha must be performed in the family every year, according to invariable Hindu custom, on the tithi on which each person died. Therefore in the present instance the śrâddha of the first man must be performed every year on the day on which Bhâdrapada kṛishṇa chaturdaśî is current, during the aparâhṇa; while that of the second must take place on the day on which the amâvâsyâ of that month is current during the aparâhṇa, and this may be separated by a whole day from the first. Lengthy treatises have been written on this subject, laying down what should be done under all such circumstances.[1]

At the time of the performance of religious ceremonies the current tithi, vâra, and all other particulars have to be pronounced; and consequently the tithi, nakshatra, etc., so declared may differ from the tithi, etc., current at sunrise. There is a vrata (observance, vow) called *Saṅkashṭanâśana-chaturthî*, by which a man binds himself to observe a fast on every kṛishṇa chaturthî up to moonrise, which takes place about 9 p.m. on that tithi, but is allowed to break the fast afterwards. And this has of course to be done on the day on which the chaturthî is current at moonrise. From the above extract the evening of the 18th September, Tuesday, is the day of this chaturthî, for though the 3rd tithi, tṛitîyâ, of the kṛishṇa paksha was current at sunrise on Tuesday it expired at 9 gh. 35 pa. after sunrise, or about 9.50 a.m. If we suppose that this man made a grant of land at the time of breaking his fast on this occasion, we should find him dating his grant "kṛishṇa chaturthî, Tuesday," though for civil purposes the date is kṛishṇa tṛitîyâ, Tuesday.

The general rule may be given briefly that for all practical and civil purposes, as well as for some ordinary religious purposes, the tithi is connected with that week-day or solar day at whose sunrise it is current, while for other religious purposes, and sometimes, though rarely, even for practical purposes also, the tithi which is current at any particular moment of a solar day or week-day is connected with that day.

32. *Adhika and kshaya tithis.* Twelve lunar months are equal to about 354 solar days *(see Art. 24 above)*, but there are 360 tithis during that time and it is thus evident that six tithis must somehow be expunged in civil (solar) reckoning. Ordinarily a tithi begins on one day and

[1] The *Nirṇayasindhu* is one of these authoritative works, and is in general use at the present time in most parts of India.

ends on the following day, that is it touches two successive civil days. It will be seen, however, from its length (*Art. 7 above*) that a tithi may sometimes begin and end within the limits of the same natural day; while sometimes on the contrary it touches three natural days, occupying the whole of one and parts of the two on each side of it.

A tithi on which the sun does not rise is expunged. It has sustained a diminution or loss (*kshaya*), and is called a *kshaya tithi*. On the other hand, a tithi on which the sun rises twice is repeated. It has sustained an increase (*vriddhi*), and is called an *adhika*, or added, *tithi*. Thus, for example, in the pañchâng extract given above (*Art. 30*) there is no sunrise during krishna saptami (7th), and it is therefore expunged. Krishna shashṭhi (6th) was current at sunrise on Friday, for it ended 16 palas after sunrise, while krishṇa saptami began 16 palas after that sunrise and ended before the next sunrise; and krishṇa ashtami (8th) is current at sunrise on the Saturday. The first day is therefore named civilly the (6th) shashṭhi, Friday, and the second is named (8th) ashtami, Saturday; while no day is left for the saptami, and it has necessarily to be expunged altogether, though, strictly speaking, it was current for a large portion of that Friday. On the other hand, there are two sunrises on Bhâdrapada śukla trayôdaśi (śukla 13th), and that tithi is therefore repeated. It commenced after 56 gh. 44 pa. on Tuesday, *i.e.*, in European reckoning about 4.20 a.m. on the Wednesday morning, was current on the whole of Wednesday, and ended on Thursday at 1 gh. 23 pa. after sunrise, or about 6.33 a.m. It therefore touched the Tuesday (reckoned from sunrise to sunrise) the Wednesday and the Thursday; two natural civil days began on it; two civil days, Wednesday and Thursday, bear its numeral (13); and therefore it is said to be repeated. [1]

In the case of an expunged tithi the day on which it begins and ends is its week-day. In the case of a repeated tithi both the days at whose sunrise it is current are its week-days.

A clue for finding when a tithi is probably repeated or expunged is given in Art. 142.

Generally there are thirteen expunctions (*kshayas*) and seven repetitions (*vriddhis*) of tithis in twelve lunar months.

The day on which no tithi ends, or on which two tithis end, is regarded as inauspicious. In the pañchâng extract above (*Art. 30*) Bhâdrapada sukla trayôdaśi Wednesday, and Bhâdrapada kṛishṇa shashṭhi, Friday (on which the saptamî was expunged), were therefore inauspicious.

33. It will be seen from the above that it is an important problem with regard to the Indian mode of reckoning time to ascertain what tithi, nakshatra, yoga, or karana was current at sunrise on any day, and when it began and ended. Our work solves this problem in all cases.

34. *Variation on account of longitude.* The moment of time when the distance between the sun and moon amounts to 12, or any multiple of 12, degrees, or, in other words, the moment of time when a tithi ends, is the same for all places on the earth's surface; and this also applies to nakshatras, yogas, and karaṇas. But the moment of sunrise of course varies with the locality, and therefore the ending moments of divisions of time such as tithis, when referred to sunrise, differ at different places. For instance, the tithi Bhâdrapada sukla pûrṇimâ (*see above Art. 30*) ended at Poona at 8 gh. 11 pa. after sunrise, or about 9.16 a.m. At a place where the sun rose 1 gh. earlier than it does at Poona the tithi would evidently have ended one ghaṭikâ later, or at 9 gh. 11 pa. after sunrise, or at about 9.40 a.m. On the other hand, at a place where

[1] Any assertions or definitions by previous writers on Hindu Chronology or Astronomy contrary to the above definitions and examples are certainly erroneous, and due to misapprehension [S. B. D.]

the sun rose 1 gh. later than at Poona the tithi would have ended when 7 gh. 11 pa. had elapsed since the sunrise at that place, or at about 8.52 a.m.

35. For this reason the expunction and repetition of tithis often differs in different localities. Thus the nakshatra Pûrvâshâḍhâ (*see pañchâṅg extract Art. 30*) was 58 gh. 11 pa. [1] at Poona on Sunday, śukla 10th. At a place which is on the same parallel of latitude, but 12 degrees eastward, the sun rises 2 gh. earlier than at Poona, and there this nakshatra ended (58 gh. 11 pa. + 2 gh =) 60 gh. 11 pa. after sunrise on Sunday, that is at 11 pa. after sunrise on Monday. It therefore touches three natural days, and therefore it (Pûrvâshâḍhâ) is repeated, whereas at Poona it is Uttarâshâḍhâ which is repeated. On the other hand, the nakshatra Maghâ on Krishṇa 13th was 3 gh. 4 pa., and Pûrva-phalgunî was (3 gh. 4 pa. + 56 gh. [2] 51 pa. =) 59 gh 55 pa. at Poona. At a place which has the same latitude as Poona, but is situated even at so short a distance as 1 degree to the east, the nakshatra Pûrva-phalgunî ended 60 gh. 5 pa after sunrise on Thursday, that is 5 pa. after sunrise on Friday; and therefore there will be no kshaya of that nakshatra at that place, but the following nakshatra Uttara phalgunî will be expunged there.

36. *True or apparent, and mean, time.* The sun, or more strictly the earth in its orbit, travels, not in the plane of the equator, but in that of the ecliptic, and with a motion which varies every day; the length of the day, therefore, is not always the same even on the equator. But for calculating the motions of the heavenly bodies it is evidently convenient to have a day of uniform length, and for this reason astronomers, with a view of obtaining a convenient and uniform measure of time, have had recourse to a mean solar day, the length of which is equal to the mean or average of all the apparent solar days in the year. An imaginary sun, called the *mean* sun, is conceived to move uniformly in the equator with the mean angular velocity of the true sun. The days marked by this mean sun will all be equal, and the interval between two successive risings of the mean sun on the equator is the duration of the mean solar day, viz., 24 hours or 60 ghaṭikâs. The time shown by the true sun is called true or apparent time, and the time shown by the mean sun is known as mean time. Clocks and watches, whose hands move, at least in theory, with uniform velocity, evidently give us mean time. With European astronomers "mean noon" is the moment when the mean sun is on the meridian; and the "mean time" at any instant is the hour angle of the mean sun reckoned westward from 0 h. to 24 h., mean noon being 0 h. for astronomical purposes.

Indian astronomers count the day from sunrise, to sunrise, and give, at least in theory, the ending moments of tithis in time reckoned from actual or true sunrise. The *true* or *apparent time of a place*, therefore, in regard to the Indian pañchâṅg, is the time counted from true (*i.e.*, actual) sunrise at that place. For several reasons it is convenient to take mean sunrise on the equator under any given meridian to be the mean sunrise at all places under the same meridian. The mean sunrise at any place is calculated as taking place at 0 gh. or 0 h.—roughly 6 a.m. in European civil reckoning; and the mean time of a place is the time counted from 0 gh. or 0 h.

The moment of true sunrise is of course not always the same at all places, but varies with the latitude and longitude. Even at the same place it varies with the declination of the sun, which

[1] Instead of writing at full length that such and such a tithi "ends at so many ghaṭikâs after sunrise", Indian astronomers say for brevity that the tithi "is so many ghaṭikâs". The phrase is so used in the text in this sense.

[2] In the case of kshayas in the pañchâṅg extract the ghaṭikâs of expunged tithis etc., are to be counted after the end of the previous tithi etc. In some pañchâṅgs the ghaṭikâs from sunrise—59 gh. 55pa. in the present instance—are given.

varies every day of the year. And at any given place, and on any given day of the year, it is not the same for all years. The calculation, therefore, of the exact moment of true sunrise at any place is very complicated—too complicated to be given in this work,[1] the aim of which is extreme simplicity and readiness of calculation, and therefore mean time at the meridian of Ujjain[2] or Lanka is used throughout what follows.

All ending moments of tithis calculated by our method C (*Arts. 159 to 160*) are in Ujjain mean time, and to convert Ujjain mean time into that of any other given place the difference of longitude in time—4 minutes (10 palas) to a degree—should be added or subtracted according as the place is east or west of Ujjain. Table XI. gives the differences of longitude in time for some of the most important places of India.

The difference between the mean and apparent (true) time of any place in India at the present day varies from *nil* (in March and October) to 26 minutes (in January and June) in the extreme southern parts of the peninsular. It is nowhere more than 65 minutes.

37. *Basis of calculation for the Tables.* All calculations made in this work in accordance with luni-solar reckoning are based on the *Sûrya-Siddhânta*, and those for solar reckoning on the *Sûrya* and *Ârya Siddhântas.* The elements of the other authorities being somewhat different, the ending moments of tithis etc., or the times of saṅkrântis as calculated by them may sometimes differ from results obtained by this work; and it must never be forgotten that, when checking the date of a document or record which lays down, for instance, that on a certain week-day there fell a certain tithi, nakshatra, or yoga, we can only be *sure* of accuracy in our results if we can ascertain the actual Siddhânta or other authority used by the author of the calendar which the drafter of the document consulted. Prof. Jacobi has given Tables for several of the principal *Siddhântas* in the *Epigraphia Indica* (*Vol. II., pp. 403 et seq.*), and these may be used whenever a doubt exists on the point.

Although all possible precautions have been taken, there, must also be a slight element of uncertainty in the results of a calculation made by our Tables owing to the difference between mean and apparent time, independently of that arising from the use of different authorities. Owing to these two defects it is necessary sometimes to be cautious. If by any calculation it is found that a certain tithi, nakshatra, yoga, or karaṇa ended nearly at the close of a solar day—as, for example, 55 ghaṭikâs after mean sunrise on a Sunday, *i.e.*, 5 ghaṭikâs before sunrise on the Monday—it is possible that it really ended shortly after true sunrise on the Monday. And, similarly, if the results shew that a certain tithi ended shortly after the commencement of a solar day,—for instance, 5 ghaṭikâs after mean sunrise on a Sunday,—it is possible that it really ended shortly before the true termination of the preceding day, Saturday.

1 Since this work was in the Press, Professor Jacobi has published in the *Epigraphia Indica* (Vol. II., pp. 487—498) a treatise with tables for the calculation of Hindu dates in true local time, to which we refer our readers.

2 Here Lanka is not Ceylon, but a place supposed to be on the equator, or in lat. 0° 0′ 0″ on the meridian of Ujjain, or longitude 75° 46′. It is of great importance to know the exact east longitude of Ujjain, since upon it depends the verification of apparent phenomena throughout India. Calculation by the different Siddhântas can be checked by the best European science if that point can be certainly determined. The great Trigonometrical Survey map makes the centre of the city 75° 49′ 45″ E. long. and 23° 11′ 10″ N. lat. But this is subject to two corrections, first, a correction of 1′ 9″ to reduce the longitude to the origin of the Madras Observatory taken as 80° 17′ 21″, and secondly, a further reduction of 2′ 30″ to reduce it to the latest value, 80° 14′ 51″, of that Observatory, total 3′ 39″. This reduces the E. long. of the centre of Ujjain city to 75° 46′ 06″. I take it therefore, that amidst conflicting authorities, the best of whom vary from 75° 43′ to 75° 51′, we may for the present accept 75° 46′ as the nearest approach to the truth. The accuracy of the base, the Observatory of Madras, will before long be again tested, and whatever difference is found to exist between the new figure and 80° 14′ 51″, that difference applied to 75° 46′ will give the correct value of the E. long. we require. [R. S.]

Five ghatikás is not the exact limit, nor of course the fixed limit. The period varies from *nil* to about five ghaṭikás, rarely more in the case of tithis, nakshatras, and karaṇas; but in the case of yogas it will sometimes reach seven ghaṭikâs.

Calculations made by our method *C* will result in the finding of a "tithi index" (*t.*), or a nakshatra or yoga-index (*n.* or *y.*), all of which will be explained further on; but it may be stated in this connection that when at any ascertained mean sunrise it is found that the resulting index is within 30 of the ending index of the tithi (*Table VIII., col. 3*), nakshatra or karaṇa (*id. col. 8, 9, 10*), or within 50 of the ending index of a yoga (*id. col. 13*), it is possible that the result may be one day wrong, as explained above. The results arrived at by our Tables, however, may be safely relied on for all ordinary purposes.

38. *Nakshatras.* There are certain conspicuous stars or groups of stars in the moon's observed path in the heavens, and from a very remote age these have attracted attention. They are called in Sanskrit "Nakshatras". They were known to the Chaldæans and to the ancient Indian Âryas. Roughly speaking the moon makes one revolution among the stars in about 27 days, and this no doubt led to the number [1] of nakshatras being limited to 27.

The distance between the chief stars, called yôga-târás, of the different nakshatras is not uniform. Naturally it should be 13° 20', but, in some cases it is less than 7°, while in others it is more than 20°. It is probable that in ancient times the moon's place was fixed merely by stating that she was near a particular named nakshatra (star) on a certain night, or on a certain occasion. Afterwards it was found necessary to make regular divisions of the moon's path in her orbit, for the sake of calculating and foretelling her position; and hence the natural division of the ecliptic, consisting of twenty-seven equal parts, came into use, and each of these parts was called after a separate nakshatra (*see Art. 8*). The starry nakshatras, however, being always in view and familiar for many centuries, could not be dispensed with, and therefore a second and unequal division was resorted to. Thus two systems of nakshatras came into use. One we call the ordinary or equal-space system, the other the unequal-space system. The names of the twenty-seven stellar nakshatras are given to both sets. In the equal-space system each nakshatra has 13° 20' of space, and when the sun, the moon, or a planet is between 0°, *i.e., no* degrees, and 13° 20' in longitude it is said to be in the first nakshatra Aśvini, and so on. The unequal-space system is of two kinds. One is described by Garga and others, and is called here the "Garga system." According to it fifteen of the nakshatras are held to be of equal average (mean) length—*i.e.*, 13° 20',—but six measure one and-a-half times the average—*i.e.*, 20°, and six others only half the average, viz., 6° 40'. The other system is described by Brahmagupta and others, and therefore we call it the "Brahma-Siddhánta" system. In its leading feature it is the same with Garga's system, but it differs a little from Garga's in introducing Abhijit in addition to the twenty-seven ordinary nakshatras. The moon's daily mean motion,—13 degrees, 10 minutes, 35 seconds,—is taken as the average space of a nakshatra. And as the total of the spaces thus allotted to the usual twenty-seven nakshatras, on a similar arrangement of unequal spaces, amounts to only 355 degrees, 45 minutes, 45 seconds, the remainder,—4 degrees, 14 minutes, 15 seconds,—is allotted to Abhijit, as an additional nakshatra placed between Uttara-Ashâḍhâ and Śravaṇa.

The longitude of the ending points of all the nakshatras according to these three systems

1 The mean length of the moon's revolution among the stars is 27.32166 days (27.321674 according to the *Sûrya Siddhânta*). Its least duration is 27 days, 4 hours, and the greatest about 7 hours longer. The number of days is thus between 27 and 28, and therefore the number of nakshatras was sometimes taken as 28 by the ancient Indian Âryas. The extra nakshatra is called *Abhijit* (*See Table VIII., col. 7.*) [S. B. D.]

is given below. The entries of "½" and "1½" in subcolumn 3 mark the variation in length from the average.

The nakshatras by any of these systems, for all years between 300 and 1900 A. D., can be calculated by our Tables *(see method "C", Arts. 139 to 160)*. The indices for them, adapted to our Tables, are given in Table VIII., cols. 8, 9, 10.

The ordinary or equal-space system of nakshatras is in general use at the present day, the unequal-space systems having almost dropped out of use. They were, however, undoubtedly prevalent to a great extent in early times, and they were constantly made use of on important religious occasions. [1]

**Longitudes of the Ending-points of the Nakshatras.**

| Order of the Nakshatras. | | System of Equal Spaces. | | Systems of Unequal Spaces. | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Garga System. | | | | Brahma-Siddhânta System. | | |
| 1 | | 2 | | 3 | 4 | | | 5 | | |
| | | Deg. | Min. | | Deg. | Min. | Sec. | Deg. | Min. | Sec. |
| 1 | Aśvinî | 13° | 20' | .... | 13° | 20' | 0 | 13° | 10' | 35" |
| 2 | Bharaṇî | 26 | 40 | ½ | 20 | 0 | 0 | 19 | 45 | 52½ |
| 3 | Krittikâ | 40 | 0 | .... | 33 | 20 | 0 | 32 | 56 | 27½ |
| 4 | Rohiṇî | 53 | 20 | 1½ | 53 | 20 | 0 | 52 | 42 | 20 |
| 5 | Mṛigaśiras | 66 | 40 | .... | 66 | 40 | 0 | 65 | 52 | 55 |
| 6 | Ârdrâ | 80 | 0 | ½ | 73 | 20 | 0 | 72 | 28 | 12½ |
| 7 | Punarvasu | 93 | 20 | 1½ | 93 | 20 | 0 | 92 | 14 | 5 |
| 8 | Pushya | 106 | 40 | .... | 106 | 40 | 0 | 105 | 24 | 40 |
| 9 | Âśleshâ | 120 | 0 | ½ | 113 | 20 | 0 | 111 | 59 | 57½ |
| 10 | Maghâ | 133 | 20 | .... | 126 | 40 | 0 | 125 | 10 | 32½ |
| 11 | Pûrva-Phalguṇî | 146 | 40 | .... | 140 | 0 | 0 | 138 | 21 | 7½ |
| 12 | Uttara-Phalguṇî | 160 | 0 | 1½ | 160 | 0 | 0 | 158 | 7 | 0 |
| 13 | Hasta | 173 | 20 | .... | 173 | 20 | 0 | 171 | 17 | 35 |
| 14 | Chitrâ | 186 | 40 | .... | 186 | 40 | 0 | 184 | 28 | 10 |
| 15 | Svâti | 200 | 0 | ½ | 193 | 20 | 0 | 191 | 3 | 27½ |
| 16 | Viśâkhâ | 213 | 20 | 1½ | 213 | 20 | 0 | 210 | 49 | 20 |
| 17 | Anurâdhâ | 226 | 40 | .... | 226 | 40 | 0 | 223 | 59 | 55 |
| 18 | Jyeshṭhâ | 240 | 0 | ½ | 233 | 20 | 0 | 230 | 35 | 12½ |
| 19 | Mûla | 253 | 20 | .... | 246 | 40 | 0 | 243 | 45 | 47½ |
| 20 | Pûrva-Ashâḍhâ | 266 | 40 | .... | 260 | 0 | 0 | 256 | 56 | 22½ |
| 21 | Uttara-Ashâḍhâ | 280 | 0 | 1½ | 280 | 0 | 0 | 276 | 42 | 15 |
| | (Abhijit) | ... | | (Balance) | .... | | | 280 | 56 | 50 |
| 22 | Śravaṇa | 293 | 20 | .... | 293 | 20 | 0 | 294 | 7 | 5 |
| 23 | Dhanishṭhâ or Śravishṭhâ | 306 | 40 | .... | 306 | 40 | 0 | 307 | 17 | 40 |
| 24 | Śatatârakâ or Śatabhishaj | 320 | 0 | ½ | 313 | 20 | 0 | 313 | 52 | 57½ |
| 25 | Pûrva-Bhadrapadâ | 333 | 20 | .... | 326 | 40 | 0 | 327 | 3 | 32½ |
| 26 | Uttara-Bhadrapadâ | 346 | 40 | 1½ | 346 | 40 | 0 | 346 | 49 | 25 |
| 27 | Revatî | 360 | 0 | .... | 360 | 0 | 0 | 360 | 0 | 0 |

39. *Auspicious Yogas.* Besides the 27 yogas described above (*Art.* 9), and quite different from them, there are in the Indian Calendar certain conjunctions, also called *yogas*, which only occur when certain conditions, as, for instance, the conjunction of certain vâras and nakshatras, or vâras and tithis, are fulfilled. Thus, when the nakshatra Hasta falls on a Sunday there occurs

[1] These systems of nakshatras are more fully described by me in relation to the "twelve-year cycle of Jupiter" in Vol. XVII. of the *Ind. Ant.*, (p. 2 ff.) [S. B. D.]

an *amrita siddhiyoga.* In the pañchâṅg extract (*Art. 30*) given above there is an *amrita siddhiyoga* on the 2nd, 5th and 18th of September. It is considered an auspicious yoga, while some yogas are inauspicious.

40. *Karaṇas.* A karaṇa being half a tithi, there are 60 karaṇas in a lunar month. There are seven karaṇas in a series of eight cycles—total 56—every month, from the second half of sukla pratipadâ (1st) up to the end of the first half of krishṇa chaturdasî (14th). The other four karaṇas are respectively from the second half of krishṇa chaturdasî (14th) to the end of the first half of sukla pratipadâ.[1]

Table VIII., col. 4, gives the serial numbers and names of karaṇas for the first half, and col. 5 for the second half, of each tithi.

40*a*. *Eclipses.* Eclipses of the sun and moon play an important part in inscriptions, since, according to ancient Indian ideas, the value of a royal grant was greatly enhanced by its being made on the occasion of such a phenomenon; and thus it often becomes essential that the moments of their occurrence should be accurately ascertained. The inscription mentions a date, and an eclipse as occurring on that date. Obviously we shall be greatly assisted in the determination of the genuineness of the inscription if we can find out whether such was actually the case. Up to the present the best list of eclipses procurable has been that published by Oppolzer in his "*Canon der Finsternisse*" (*Denkschriften der Kaiserl. Akademie der Wissenschaften, Vienna, Vol. LII.*), but this concerns the whole of our globe, not merely a portion like India; the standard meridian is that of Greenwich, requiring correction for longitude; and the accompanying maps are on too small a scale to be useful except as affording an approximation from which details can be worked out. Our object is to save our readers from the necessity of working out such complicated problems. Prof. Jacobi's Tables in the *Indian Antiquary* (Vol. XVII.) and *Epigraphia Indica* (Vol. II.) afford considerable help, but do not entirely meet the requirements of the situation. Dr. Schram's contribution to this volume, and the lists prepared by him, give the dates of all eclipses in India and the amount of obscuration observable at any place. His article speaks for itself, but we think it will be well be add a few notes.

Prof. Jacobi writes (*Epig. Ind., II., p. 422*):—"The eclipses mentioned in inscriptions are not always actually observed eclipses, but calculated ones. My reasons for this opinion are the following: Firstly, eclipses are auspicious moments, when donations, such as are usually recorded in inscriptions, are particularly meritorious. They were therefore probably selected for such occasions, and must accordingly have been calculated beforehand. No doubt they were entered in panchâṅgs or almanacs in former times as they are now. Secondly, even larger eclipses of the sun, up to seven digits, pass unobserved by common people, and smaller ones are only visible under favourable circumstances. Thirdly, the Hindus place implicit trust in their Sâstras, and would not think it necessary to test their calculations by actual observation. The writers of inscriptions would therefore mention an eclipse if they found one predicted in their almanacs."

Our general Table will occasionally be found of use. Thus a lunar eclipse can only occur at the time of full moon (*pûrṇimâ*), and can only be visible when the moon is above the horizon at the place of the observer; so that when the pûrṇimâ is found by our Tables to occur during most part of the daytime there can be no visible eclipse. But it is possibly visible if the pûrṇimâ is found, on any given meridian, to end within 4 ghaṭikâs after sunrise, or within 4 ghaṭikâs before sunset. A solar eclipse occurs only on an amâvâsyâ or new moon day. If

[1] According to the *Sûrya-Siddhânta* the four karaṇas are Sakuni, Nâga, Chatushpada and Kiṁstughna, but we have followed the present practice of Western India, which is supported by Varâhamihira and Brahmagupta.

the amâvâsyâ ends between sunset and sunrise it is not visible. If it ends between sunrise and sunset it may be visible, but not of course always.

41. *Lunar months and their names.* The usual modern system of naming lunar months is given above (Art. 14), and the names in use will be found in Tables II. and III. In early times, however, the months were known by another set of names, which are given below, side by side with those by which they are at present known.

| Ancient names. | Modern names. | Ancient names. | Modern names. |
|---|---|---|---|
| 1. Madhu | Chaitra | 7. Isha | Âśvina |
| 2. Mâdhava | Vaiśâkha | 8. Ûrja | Kârttika |
| 3. Śukra | Jyeshṭha | 9. Sahas | Mârgaśîrsha |
| 4. Śuchi | Âshâḍha | 10. Sahasya | Pausha |
| 5. Nabhas | Śrâvaṇa | 11. Tapas | Mâgha |
| 6. Nabhasya | Bhâdrapada | 12. Tapasya | Phâlguna |

The names "Madhu" and others evidently refer to certain seasons and may be called season-names[1] to distinguish them from "Chaitra" and those others which are derived from the nakshatras. The latter may be termed sidereal names or star-names. Season-names are now nowhere in use but are often met with in Indian works on astronomy, and in Sanskrit literature generally.

The season-names of months are first met with in the *mantra* sections, or the *Saṁhitâs*, of both the Yâjur-Vedas, and are certainly earlier than the sidereal names which are not found in the *Saṁhitâs* of any of the Vedas, but only in some of the *Brâhmaṇas*, and even there but seldom.[2]

42. The sidereal names "Chaitra", etc., are originally derived from the names of the nakshatras. The moon in her revolution passes about twelve times completely through the twenty-seven starry nakshatras in the course of the year, and of necessity is at the full while close to some of them. The full-moon tithi (*pûrṇimâ*), on which the moon became full when near the nakshatra Chitrâ, was called *Chaitrî*; and the lunar month which contained the *Chaitrî pûrṇimâ* was called *Chaitra* and so on.

43. But the stars or groups of stars which give their names to the months are not at equal distances from one another; and as this circumstance,—together with the phenomenon of the moon's apparent varying daily motion, and the fact that her synodic differs from her sidereal revolution—prevents the moon from becoming full year after year in the same nakshatra, it was natural that, while the twenty-seven nakshatras were allotted to the twelve months, the months themselves should be named by taking the nakshatras more or less alternately. The nakshatras thus allotted to each month are given on the next page.

44. It is clear that this practice, though it was natural in its origin and though it was ingeniously modified in later years, must often have occasioned considerable confusion; and so we find that the months gradually ceased to have their names regulated according to the conjunction of full moons and nakshatras, and were habitually named after the solar months in which they occurred. This change began to take place about 1400 B.C., the time of the

[1] *Madhu* is "honey", "sweet spring". *Mâdhava*, "the sweet one". *Śukra* and *Śuchi* both mean "bright". *Nabhas*, the rainy season. *Nabhasya*, "vapoury", "rainy". *Ish* or *Isha*, "draught" or "refreshment", "fertile". *Ûrj*, "strength", "vigour". *Sahas* "strength". *Sahasya* "strong". *Tapas* "penance", "mortification", "pain", "fire". *Tapasya*, "produced by heat", "pain". All are Vedic words.

[2] In my opinion the sidereal names "Chaitra" and the rest, came into use about 3000 B.C. They are certainly not later than 1500 B.C., and not earlier than 4000 B.C. [S. B. D.]

*Vedânga-jyotisha*; and from the time when the zodiacal-sign-names, "Mesha" and the rest, came into use till the present day, the general rule has been that that amanta lunar month in which the Mesha saṅkrânti occurs, is called *Chaitra*, and the rest in succession.

**Derivation of the Names of the Lunar Months from the Nakshatras.**

| Names and Grouping of the Nakshatras. | Names of the Months |
|---|---|
| Kṛittikâ, Rohiṇî . . . . . . . . . . . . . . . . . | Kârttika. |
| Mṛigaśiras; Ârdrâ . . . . . . . . . . . . . . . . | Mârgaśîrsha. |
| Punarvasu; Pushya . . . . . . . . . . . . . . . . | Pausha. |
| Âśleshâ; Maghâ . . . . . . . . . . . . . . . . . | Mâgha. |
| Pûrva-Phalguni; Uttara-Phalguni; Hasta . . . . . . . | Phâlguna. |
| Chitrâ; Svâti . . . . . . . . . . . . . . . . . . | Chaitra. |
| Viśâkhâ; Anurâdhâ . . . . . . . . . . . . . . . . | Vaiśâkha. |
| Jyeshṭhâ; Mûla . . . . . . . . . . . . . . . . . | Jyeshṭha. |
| Pûrva-Ashâḍha; Uttara-Ashâḍhâ; (Abhijit) . . . . . . . | Âshâḍha. |
| (Abhijit); Śravaṇa, Dhanishṭhâ | Śrâvaṇa. |
| Śatatârakâ; Pûrva-Bhadrapadâ, Uttara-Bhadrapadâ | Bhâdrapada. |
| Revatî; Aśvinî; Bharaṇî . . . . . . . . . . . . . . | Âśvina. |

45. *Adhika and kshaya mâsas.* It will be seen from Art. 24 that the mean length of a solar month is greater by about nine-tenths of a day than that of a lunar month, and that the true length of a solar month, according to the *Sûrya-Siddhânta*, varies from 29 d. 7 h. 38 m. to 31 d. 15 h. 28 m. Now the moon's synodic motion, viz., her motion relative to the sun, is also irregular, and consequently all the lunar months vary in length. The variation is approximately from 29 d. 7 h. 20 m. to 29 d. 19 h. 30 m., and thus it is clear that in a lunar month there will often be no solar saṅkrânti, and occasionally, though rarely, two. This will be best understood by the following table and explanation. *(See p. 26.)*

We will suppose *(see the left side of the diagram, cols. 1, 2.)* that the sun entered the sign Mesha,—that is, that the Mesha saṅkrânti took place, and therefore the solar month Mesha commenced,—shortly before the end of an amânta lunar month, which was accordingly named "Chaitra" in conformity with the above rule *(Art. 14, or 44)*; that the length of the solar month Mesha was greater than that of the following lunar month; and that the sun therefore stood in the same sign during the whole of that lunar month, entering the sign Vṛishabha shortly after the beginning of the third lunar month, which was consequently named Vaiśâkha because the Vṛishabha saṅkrânti took place, and the solar month Vṛishabha commenced, in it,—the Vṛishabha saṅkrânti being the one next following the Mesha saṅkrânti. Ordinarily there is one saṅkrânti in each lunar month, but in the present instance there was no saṅkrânti whatever in the second lunar month lying between Chaitra and Vaiśâkha.

The lunar month in which there is no saṅkrânti is called an *adhika* (added or intercalated) month; while the month which is not adhika, but is a natural month because a saṅkrânti actually occurred in it, is called *nija*, *i.e.*, true or regular month.[1] We thus have an added month between natural Chaitra and natural Vaiśâkha.

[1] Professor Kielhorn is satisfied that the terms *adhika* and *nija* are quite modern, the nomenclature usually adopted in documents and inscriptions earlier than the present century being *prathama* (first) and *dvitîya* (second). He alluded to this in *Ind. Ant.*, XX., p. 411. [R. S.]

The next peculiarity is that when there are two saṅkrântis in a lunar month there is a *kshaya mâsa*, or a complete expunction of a month. Suppose, for instance, that the Vrischika saṅkrânti took place shortly after the beginning of the amânta lunar month Kârttika (*see the lower half of the diagram col. 2*); that in the next lunar month the Dhanus-saṅkrânti took place

| *Amânta lunar months.* | *Solar months, saṅkrânti to saṅkrânti.* | *Fortnights.* | *Pûrnimânta lunar months.*[1] *By one system.* | *Pûrnimânta lunar months.*[1] *By another system.* |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| Chaitra. | | Śukla | ½ Chaitra | ½ Chaitra |
| | —Mesha saṅkrânti | Krishna | Vaiśâkha | First Vaiśâkha |
| Adhika Vaiśâkha | *Intercalated period.* | Śukla | Adhika Vaiśâkha | |
| | | Krishna | | Second Vaiśâkha |
| Nija Vaiśâkha | —Vrishabha saṅkrânti | Śukla | Vaiśâkha | |
| | | Krishna | ½ Jyeshtha | ½ Jyeshtha |
| *(Several months are omitted here.)* | | | | |
| Kârttika | —Vrischika saṅkrânti | Śukla | ½ Kârttika | ½ Kârttika |
| | | Krishna | Mârgaśîrsha | Mârgaśîrsha |
| Mârgaśîrsha *(Pausha suppressed)* | —Dhanus saṅkrânti | Śukla | | |
| | | Krishna | *(Pausha suppressed)* Mâgha | *(Pausha suppressed)* Mâgha |
| Mâgha | —Makara saṅkrânti | Śukla | | |
| | —Kumbha saṅkrânti | Krishna | ½ Phâlguna | ½ Phâlguna |

shortly after it began, and the Makara-saṅkrânti shortly before it ended, so that there were two saṅkrântis in it; and that in the third month the Kumbha-saṅkrânti took place before the end of it. The lunar month in which the Kumbha-saṅkrânti occurred is naturally the month Mâgha. Thus between the natural Kârttika and the natural Mâgha there was only one lunar month instead of two, and consequently one is said to be expunged.

46. *Their names.* It will be seen that the general brief rule (*Art. 44*) for naming lunar months is altogether wanting in many respects, and therefore rules had to be framed to meet the emergency. But different rules were framed by different teachers, and so arose a difference in practice. The rule followed at present is given in the following verse.

*Mînâdistho Ravir yeshâm ârambha-prathame kshaṇe | bhavet te 'bde Chândra mâsâś chaitrâdyâ dvâdaśa smṛitâḥ."* ||

[1] The scheme of *pûrṇimânta* months and the rule for naming the intercalated months known to have been in use from the 12th century A.D., are followed in this diagram.

"The twelve lunar months, at whose first moment the sun stands in Mîna and the following [signs], are called Chaitra, and the others [in succession]."

According to this rule the added month in the above example (*Art. 45*) will be named Vaiśâkha, since the sun was in Mesha when it began; and in the example of the expunged month the month between the natural Kârttika and the natural Mâgha will be named Mârgaśirsha, because the sun was in Vṛischika when it commenced, and Pausha will be considered as expunged.

This rule is given in a work named *Kâlatattva-vivechana*, and is attributed to the sage Vyâsa. The celebrated astronomer Bhâskarâchârya (A. D. 1150) seems to have followed the same rule, [1] and it must therefore have been in use at least as early as the 12th century A. D. As it is the general rule obtaining through most part of India in the present day we have followed it in this work.

There is another rule which is referred to in some astronomical and other works, and is attributed to the *Brahma-Siddhânta*. [2] It is as follows:

"*Meshâdisthe Savitari yo yo mâsaḥ prapûryate chầndraḥ | Chaitrâdyaḥ sa jñeyaḥ pûrtidvitve 'dhimâso 'nyaḥ.*" ||

"That lunar month which is completed when the sun is in [the sign] Mesha etc., is to be known as Chaitra, etc. [respectively]; when there are two completions, the latter [of them] is an added month."

It will be seen from the Table given above (p. 26) that for the names of ordinary months both rules are the same, but that they differ in the case of added and suppressed months. The added month between natural Chaitra and natural Vaiśâkha, in the example in *Art. 45*, having ended when the sun was in Mesha, would be named "Chaitra" by this second rule, but "Vaiśâkha" by the first rule, because it commenced when the sun was in Mesha. Again, the month between natural Kârttika and natural Mâgha, in the example of an expunged month, having ended when the sun was in Makara, would be named "Pausha" by this second rule, and consequently Mârgaśirsha would be expunged; while by the first rule it would be named "Mârgaśirsha" since it commenced when the sun was in Vṛischika, and Pausha would be the expunged month. It will be noticed, of course, that the difference is only in name and not in the period added or suppressed. [3] Both these rules should be carefully borne in mind when studying inscriptions or records earlier than 1100 A. D.

47. *Their determination according to true and mean systems.* It must be noted with regard to the intercalation and suppression of months, that whereas at present these are regulated by the sun's and moon's apparent motion,—in other words, by the apparent length of the solar and lunar months—and though this practice has been in use at least from A. D. 1100 and was followed by Bhaskarâchârya, there is evidence to show that in earlier times they were regulated by the mean length of months. It was at the epoch of the celebrated astronomer Śrîpati, [4] or about A. D. 1040, that the change of practice took place, as evidenced by the following passage in his *Siddhânta Śekhara*, (quoted in the *Jyotisha-darpaṇa*, in A. D. 1557.)

[1] See his *Siddhânta-Śiromaṇi, madhyamâdhikâra, adhimâsanirṇaya*, verse 6, and his own commentary on it. [S. B. D.]

[2] It is not to be found in either of the *Brahma-Siddhântas* referred to above, but there is a third Brahma-Siddhânta which I have not seen as yet. [S. B. D.]

[3] In Prof. Chhatre's list of added and suppressed months, in those published in Mr. Cowasjee Patell's *Chronology*, and in General Sir A. Cunningham's *Indian Eras* it is often noted that the same month is both added and suppressed. But it is clear from the above rules and definitions that this is impossible. A month cannot be both added and suppressed at the same time. The mistake arose probably from resort being made to the first rule for naming *adhika* months, and to the second for the suppressed months.

[4] Thanks are due to Mr. Mahadeo Chimnâji Apte, B.A., LL.B., very recently deceased, the founder of the Ânandâśrama at Poona, for his discovery of a part of Śrîpati's *Karaṇa* named the *Dhîkoṭida*, from which I got Śrîpati's date. I find that it was written in Śaka 961 expired (A.D. 1039-40). [S. B. D.]

*Madhyama-Ravi-sankrânti-praveśa-rahito bhaved adhikaḥ*
*Madhyaś Chândro mâse madhyâdhika-lakshaṇam chaitat |*
*Vidvâṁsas-tv-âchâryâ nirasya madhyâdhikaṁ mâsaṁ*
*Kuryuḥ sphuṭa-mânena hi yato 'dhikaḥ spashṭa eva syât. |*

"The lunar month which has no mean sun's entrance into a sign shall be a mean intercalated month. This is the definition of a mean added month. The learned Âchâryas should leave off [using] the mean added months, and should go by apparent reckoning, by which the added month would be apparent (true)."

It is clear, therefore, that mean intercalations were in use up to Śrîpatis time. In the *Vedânga Jyotisha* only the mean motions of the sun and moon are taken into account, and it may therefore be assumed that at that time the practice of regulating added and suppressed months by apparent motions was unknown. These apparent motions of the sun and moon are treated of in the astronomical *Siddhântas* at present in use, and so far as is known the present system of astronomy came into force in India not later than 400 A. D. [1] But on the other hand, the method of calculating the ahargaṇa (a most important matter), and of calculating the places of planets, given in the *Sûrya* and other *Siddhântas*, is of such a nature that it seems only natural to suppose that the system of mean intercalations obtained for many centuries after the present system of astronomy came into force, and thus we find Śrîpati's utterance quoted in an astronomical work of the 15th century. There can be no suppression of the month by the mean system, for the mean length of a solar month is longer than that of a mean lunar month, and therefore two mean sankrântis cannot take place in a mean lunar month.

The date of the adoption of the true (apparent) system of calculating added and suppressed months is not definitely known. Bhâskarâchârya speaks of suppressed months, and it seems from his work that mean intercalations were not known in his time (A. D. 1150.) We have therefore in our Tables given mean added months up to A. D. 1100, and true added and suppressed months for the whole period covered by our Tables. [2]

48. For students more familiar with solar reckoning we will give the rules for the intercalation and suppression of months in another form. Ordinarily one lunar month ends in each solar month. When two lunar months end in a solar month the latter of the two is said to be an *adhika* (added or intercalated) month, and by the present practice it receives the name of the following natural lunar month, but with the prefix *adhika*. Thus in the Table on p. 25, two lunar months end during the solar month Mesha, the second of which is *adhika* and receives, by the present practice, the name of the following natural lunar month, Vaiśâkha. When no lunar month ends in a solar month there is a *kshaya mâsa*, or expunged or suppressed month; *i.e.*, the name of one lunar month is altogether dropped, viz., by the present practice, the one following that which would be derived from the solar month. Thus, in the Table above, no lunar month ends in the solar month Dhanus. Mârgaśirsha is the name of the month in which the Dhanus sankrânti occurs; the name Pausha is therefore expunged.

The rule for naming natural lunar months, and the definition of, and rule for naming, added

1 Up to recently the date was considered to be about the 6th century A.D. Dr. Thibaut, one of the highest living authorities on Indian Astronomy, fixes it at 400 A.D. (See his edition of the *Pañcha Siddhântikâ* Introd., p. LX.). My own opinion is that it came into existence not later than the 2nd century B.C. [S. B. D.]

2 I am inclined to believe that of the two rules for naming lunar months the second was connected with the mean system of added months, and that the first came into existence with the adoption of the true system. But I am not as yet in possession of any evidence on the point. See, however, the note to Art. 51 below. [S. B. D.]

and suppressed months, may be summed up as follows. That amânta lunar month in which the Mesha sankrânti occurs is called Chaitra, and the rest in succession. That amânta lunar month in which there is no saṅkrânti is *adhika* and receives the name (1) of the preceding natural lunar month by the old *Brahma-Siddhânta* rule, (2) of the following natural lunar month by the present rule. When there are two saṅkrântis in one amânta lunar month, the name which would be derived from the first is dropped by the old *Brahma-Siddhânta* rule, the name which would be derived from the second is dropped by the present rule.

49. *Different results by different Siddhântas.* The use of different *Siddhântas* will sometimes create a difference in the month to be intercalated or suppressed, but only when a saṅkrânti takes place very close [1] to the end of the amâvâsyâ. Such cases will be rare. Our calculations for added and suppressed months have been made by the *Sûrya-Siddhânta*, and to assist investigation we have been at the pains to ascertain and particularize the exact moments (given in tithi-indices, and tithis and decimals) of the saṅkrântis preceding and succeeding an added or suppressed month, from which it can be readily seen if there be a probability of any divergence in results if a different *Siddhânta* be used. The Special Tables published by Professor Jacobi in the *Epigraphia Indica* (Vol., II., pp. 403 ff.) must not be relied on for calculations of added and suppressed months of *Siddhântas* other than the *Sûrya-Siddhânta*. If a different *Siddhânta* happened to have been used by the original computor of the given Hindu date, and if such date is near to or actually in an added or suppressed month according to our Table I., it is possible that the result as worked out by our Tables may be a whole month wrong. Our mean intercalations from A. D. 300 to 1100 are the same by the original *Sûrya-Siddhânta*, the present *Sûrya-Siddhânta*, and the first *Ârya-Siddhânta*.

50. *Some peculiarities.* Certain points are worth noticing in connection with our calculations of the added and suppressed months for the 1600 years from A. D. 300 to 1900 according to the *Sûrya-Siddhânta*.

(*a*) Intercalations occur generally in the 3rd, 5th, 8th, 11th, 14th, 16th and 19th years of a cycle of 19 years. (*b*) A month becomes intercalary at an interval of 19 years over a certain period, and afterwards gives way generally to one of the months preceding it, but sometimes, though rarely, to the following one. (*c*) Out of the seven intercalary months of a cycle one or two are always changed in the next succeeding cycle, so that after a number of cycles the whole are replaced by others. (*d*) During our period of 1600 years the months Mârgaśirsha, Pausha, and Mâgha are never intercalary. (*e*) The interval between years where a suppression of the month occurs is worth noticing. In the period covered by our Tables the first suppressed month is in A.D. 404, and the intervals are thus: 19, 65, 38, 19, 19, 46, 19, 141, 122, 19, 141, 141, 65, 19, 19, 19, 19, 46, 76, 46, 141, 141, and an unfinished period of 78 years. At first sight there seems no regularity, but closer examination shews that the periods group themselves into three classes, viz., (i.) 19, 38, 76; (ii.) 141; and (iii.) 122, 65 and 46 years; the first of which consists of 19 or its multiples, the second is a constant, and the third is the difference between (ii.) and (i.) or between 141 and a multiple of 19. The unfinished period up to 1900 A.D. being 78 years we are led by these peculiarities to suppose that there will be no suppressed month till at earliest (122 years =)

1 It is difficult to define the exact limit, because it varies with different *Siddhântas* and even for one *Siddhânta* it is not always the same. It is, however, generally not more than six ghaṭikâs or about 33 of our tithi-indices (*t*). But in the case of some *Siddhântas* as corrected with a bîja the difference may amount sometimes to as much as 20 ghaṭikâs, or 113 of our tithi-indices. It would be very rare to find any difference in true added months, but in the case of suppressed months we might expect some divergence, a month suppressed by one authority not being the same as that suppressed by another, or there being no suppression at all by the latter in some cases. Differences in mean added months would be very rare, except in the case of the *Brahma-Siddhânta*. *(See Art. 88.)*

A.D. 1944, and possibly not till (141 years =) A.D. 1963.[1] (*d*) Mâgha is only once suppressed in Saka 1398 current, Mârgasîrsha is suppressed six times, and Pausha 18 times. No other month is suppressed.

Bhâskarâchârya lays down[2] that Kârttika, Mârgasirsha and Pausha only are liable to be suppressed, but this seems applicable only to the *Brahma-Siddhânta* of which Bhâskarâchârya was a follower. He further states, "there was a suppressed month in the Saka year 974 expired, and there will be one in Śaka 1115, 1256 and 1378 all expired", and this also seems applicable to the *Brahma-Siddhânta* only. By the *Sûrya-Siddhânta* there were suppressed months in all these years except the last one, and there was an additional suppression in Śaka 1180 expired.

Gaṇeśa Daivajña, the famous author of the *Grahalâghava* (A.D. 1520), as quoted by his grandson, in his commentary on the *Siddhânta-Siromaṇi*, says, "By the *Sûrya-Siddhânta* there will be a suppressed month in Saka 1462, 1603, 1744, 1885, 2026, 2045, 2148, 2167, 2232, 2373, 2392, 2514, 2533, 2655, 2674, 2796 and 2815, and by the *Ârya-Siddhânta*[3] there will be one in 1481, 1763, 1904, 2129, 2186, 2251 (all expired)." The first four by *Sûrya* calculations agree with our results.

51. By the *pûrṇimânta scheme*. Notwithstanding that the pûrṇimânta scheme of months is and was in use in Northern India, the amânta scheme alone is recognized in the matter of the nomenclature and intercalation of lunar months and the commencement of the luni-solar year. The following is the method adopted—first, the ordinary rule of naming a month is applied to an amânta lunar month, and then, by the pûrṇimânta scheme, the dark fortnight of it receives the name of the following month. The correspondence of amânta and pûrṇimânta fortnights for a year is shown in Table II., Part i., and it will be observed that the bright fortnights have the same name by both schemes while the dark fortnights differ by a month, and thus the pûrnimânta scheme is always a fortnight in advance of the amânta scheme.

The saṅkrântis take place in definite amânta lunar months, thus the Makara-saṅkrânti invariably takes place in amânta Pausha, and in no other month; but when it takes place in the krishṇa-paksha of amânta Pausha it falls in pûrṇimânta Mâgha, because that fortnight is said to belong to Mâgha by the pûrṇimânta scheme. If, however, it takes place in the sukla paksha, the month is Pausha by both schemes. Thus the Makara-saṅkrânti, though according to the amânta scheme it can only fall in Pausha, may take place either in Pausha or Mâgha by the pûrṇimânta scheme; and so with the rest.

The following rules govern pûrṇimânta intercalations. Months are intercalated at first as if there were no pûrṇimânta scheme, and afterwards the dark fortnight preceding the intercalated month receives, as usual, the name of the month to which the following natural bright fortnight belongs, and therefore the intercalated month also receives that name. Thus, in the example given above (*Art. 45*), intercalated amânta Vaisâkha (as named by the first rule) lies between natural amânta Chaitra and natural amânta Vaisâkha. But by the pûrṇimanta scheme the dark half of natural amânta Chaitra acquires the name of natural Vaisâkha; then follow the two fortnights of adhika Vaisâkha; and after them comes the bright half of the (nija) natural pûrnimânta

[1] This relation of intervals is a distinct assistance to calculation, as it should lead us to look with suspicion on any suppression of a month which does not conform to it.

[2] See the *Siddhânta-Siromaṇi*, *Madhyamâdhikâra*. Bhâskara wrote in Saka 1072 (A.D. 1150). He did not give the names of the suppressed months.

[3] I have ascertained that Gaṇesa has adopted in his *Grahalâghava* some of the elements of the *Ârya-Siddhânta* as corrected by Lalla's bîja, and by putting to test one of the years noted I find that in these calculations also the *Ârya-Siddhânta* as corrected by Lalla's bîja was used. Gaṇesa was a most accurate calculator, and I feel certain that his results can be depended upon. [S. B. D.]

Vaiśâkha. Thus it happens that half of natural pûrṇimânta Vaiśâkha comes before, and half after, the intercalated month.[1]

Of the four fortnights thus having the name of the same month the first two fortnights are sometimes called the "*First Vaiśâkha*," and the last two the "*Second Vaiśâkha*."

It will be seen from Table II., Part i., that amânta Phâlguna kṛishna is pûrṇimânta Chaitra kṛishṇa. The year, however, does not begin then, but on the same day as the amânta month, *i.e.*, with the new moon, or the beginning of the next bright fortnight.

Having discussed the lesser divisions of time, we now revert to the Hindu year. And, first, its beginning.

## *Years and Cycles.*

52. *The Hindu New-year's Day.*—In Indian astronomical works the year is considered to begin, if luni-solar, invariably with amânta Chaitra Śukla 1st,—if solar with the Mesha saṅkrânti; and in almost all works *mean* Mesha saṅkrânti is taken for convenience of calculations, very few works adopting the apparent or true one. At present in Bengal and the Tamil country, where solar reckoning is in use, the year, for religious and astronomical purposes, commences with the apparent Mesha-saṅkrânti, and the civil year with the first day of the month Mesha, as determined by the practice of the country (*See above Art. 28*). But since mean Mesha-saṅkrânti is taken as the commencement of the solar year in astronomical works, it is only reasonable to suppose that the year actually began with it in practice in earlier times, and we have to consider how long ago the practice ceased.

In a *Karaṇa* named *Bhâsvatî* (A. D. 1099) the year commences with apparent Mesha saṅkrânti, and though it is dangerous to theorize from one work, we may at least quote it as shewing that the present practice was known as early as A. D. 1100. This date coinciding fairly well with Śrîpati's injunction quoted above (*Art. 47*) we think it fair to assume for the present that the practice of employing the mean Mesha saṅkrânti for fixing the beginning of the year ceased about the same time as the practice of mean intercalary months.

The luni-solar Chaitrâdi[2] year commences, for certain religious and astrological purposes, with the first moment of the first tithi of Chaitra, or Chaitra śukla pratipadâ and this, of course, may fall at any time of the day or night, since it depends on the moment of new moon. But for the religious ceremonies connected with the beginning of a samvatsara (year), the sunrise of the day on which Chaitra śukla pratipadâ is current at sunrise is taken as the first or opening day of the year. When this tithi is current at sunrise on two days, as sometimes happens, the first, and when it is not current at any sunrise (*i.e.*, when it is expunged) then the day on which it ends, is taken as the opening day. For astronomical purposes the learned take any convenient

1 Such an anomaly with regard to the pûrṇimânta scheme could not occur if the two rules were applied, one that "that pûrṇimânta month in which the Mesha saṅkrânti occurs is always called Chaitra, and so on in succession," and the other that "that pûrṇimânta month in which no saṅkrânti occurs is called an intercalated month." The rules were, I believe, in use in the sixth century A. D. (*See my remarks Ind. Ant.*, I.X., *p.* 50 *f.*) But the added month under such rules would never agree with the amânta added months. There would be from 14 to 17 months' difference in the intercalated months between the two, and much inconvenience would arise thereby. It is for this reason probably that the pûrṇimânta scheme is not recognised in naming months, and that pûrṇimânta months are named arbitrarily, as described in the first para. of Art. 51. This arbitrary rule was certainly in use in the 11th century A.D. (*See Ind. Ant.*, *vol. VI.*, *p.* 53, where the Makara-saṅkrânti is said to have taken place in Mâgha.)

After this arbitrary rule of naming the pûrṇimânta months once came into general use it was impossible in Northern India to continue using the second, or *Brahma-Siddhânta*, rule for naming the months. For in the example in *Art.* 45 above the intercalated month would by that rule be named Chaitra, but if its preceding fortnight be a fortnight of Vaiśâkha it is obvious that the intercalated month cannot be named Chaitra. In Southern India the practice may have continued in use a little longer. [S. B. D.]

2 *Chaitrâdi*, "beginning with Chaitra"; *Kârttikâdi*, "beginning with Kârttika; *Meshâdi*, with Mesha, and so on.

moment,—such as mean sunrise, noon, sunset, or midnight, but generally the sunrise,—on or before Chaitra śukla pratipadâ, as their starting-point.[1] Sometimes the beginning of the mean Chaitra śukla pratipadâ is so taken.

When Chaitra is intercalary there seems to be a difference of opinion whether the year in that case is to begin with the intercalated (*adhika*) or natural (*nija*) Chaitra. For the purposes of our Table I. (cols. 19 to 25) we have taken the adhika Chaitra of the true system as the first month of the year.

But the year does not begin with Chaitra all over India. In Southern India and especially in Gujarât the years of the Vikrama era commence in the present day with Kârttika śukla pratipadâ. In some parts of Kâṭhiâvâḍ and Gujarât the Vikrama year commences with Âshâḍha śukla pratipadâ.[2] In a part of Ganjam and Orissa, the year begins on Bhâdrapada śukla 12th. (*See under Oṅko reckoning, Art. 64.*) The Amli year in Orissa begins on Bhâdrapada śukla 12th, the Vilâyati year, also in general use in Orissa, begins with the Kanyâ saṅkrânti; and the Fasli year, which is luni-solar in Bengal, commences on pûrṇimânta Âśvina kṛi 1st (viz., 4 days later than the Vilâyati).

In the South Malayâlam country (Travancore and Cochin), and in Tinnevelly, the solar year of the Kollam era, or Kollam âṇḍu, begins with the month Chiṅgam (Siṁha), and in the North Malayâlam tract it begins with the month Kanni (Kanyâ). In parts of the Madras Presidency the Fasli year originally commenced on the 1st of the solar month Âḍi (Karka), but by Government order about A.D. 1800 it was made to begin on the 13th of July, and recently it was altered again, so that now it begins on 1st July. In parts of the Bombay Presidency the Fasli year begins when the sun enters the nakshatra Mṛigaśirsha, which takes place at present about the 5th or 6th of June.

Alberuni mentions (A.D. 1030) a year commencing with Mârgaśirsha as having been in use in Sindh, Multân, and Kanouj, as well as at Lahore and in that neighbourhood; also a year commencing with Bhâdrapada in the vicinity of Kashmir.[3] In the *Mahâbhârata* the names of the months are given in some places, commencing with Mârgaśirsha. (*Anuśâsana parva adhyâyas 106 and 109*). In the *Vedâṅga Jyotisha* the year commences with Mâgha śukla pratipadâ.

55. *The Sixty-year cycle of Jupiter.*[4] In this reckoning the years are not known by numbers, but are named in succession from a list of 60 names, often known as the "Brihaspati samvatsara chakra,"[5] the wheel or cycle of the years of Jupiter. Each of these years is called a "samvatsara." The word "samvatsara" generally means a year, but in the case of this cycle the year is not equal to a solar year. It is regulated by Jupiter's mean motion; and a Jovian year is the period during which the planet Jupiter enters one sign of the zodiac and passes completely through it

[1] See *Ind. Ant.*, XIX., p. 46, second paragraph of my article on the Original *Sûrya-Siddhânta*. [S. B. D.]

[2] I have myself seen a pañchâṅg which mentions this beginning of the year, and have also found some instances of the use of it in the present day. I am told that at Idar in Gujarât the Vikrama samvat begins on Âshâḍha krishṇa dvitîyâ. [S. B. D.]

[3] The passage, as translated by Sachau (Vol. II., p. 8 f), is as follows. "Those who use the Śaka era, the astronomers, begin the year with the month Chaitra, whilst the inhabitants of Kanîr, which is conterminous with Kashmîr, begin it with the month Bhâdrapada.... All the people who inhabit the country between Bardarî and Mârîgala begin the year with the month Kârttika.... The people living in the country of Nîrahara, behind Mârîgala, as far as the utmost frontiers of Tâkeshar and Lohâvar, begin the year with the month Mârgaśîrsha.... The people of Lanbaga, i.e., Lamghân, follow their example. I have been told by the people of Multân that this system is peculiar to the people of Sindh and Kanoj, and that they used to begin the year with the new moon of Mârgaśîrsha, but that the people of Multân only a few years ago had given up this system, and had adopted the system of the people of Kashmîr, and followed their example in beginning the year with the new moon of Chaitra."

[4] Articles 55 to 61 are applicable to Northern India only (*See Art. 62.*)

[5] The term is one not recognised in Sanskrit works. [S. B. D.]

with reference to his mean motion. The cycle commences with Prabhava. See Table I., cols. 6, 7, and Table XII.

54. The duration of a Bârhaspatya samvatsara, according to the *Sûrya-Siddhânta*, is about 361.026721 days, that is about 4.232 days less than a solar year. If, then, a samvatsara begins exactly with the solar year the following samvatsara will commence 4.232 days before the end of it. So that in each successive year the commencement of a samvatsara will be 4.232 days in advance, and a time will of course come when two samvatsaras will begin during the same solar year. For example, by the *Sûrya-Siddhânta* with the bîja, Prabhava (No. 1) was current at the beginning of the solar year Saka 1779. Vibhava (No. 2) commenced 3.3 days after the beginning of that year, that is after the Mesha sankrânti; and Sukla (No. 3) began 361.03 days after Vibhava, that is 364.3 days after the beginning of the year. Thus Vibhava and Sukla both began in the same solar year. Now as Prabhava was current at the beginning of Śaka 1779, and Śukla was current at the beginning of Śaka 1780, Vibhava was expunged in the regular method followed in the North. Thus the rule is that when two Bârhaspatya samvatsaras begin during one solar year the first is said to be expunged, or to have become *kshaya*; and it is clear that when a samvatsara begins within a period of about 4.232 days after a Mesha sankrânti it will be expunged.

By the *Sûrya Siddhânta* $85\frac{45}{211}$ solar years are equal to $86\frac{45}{211}$ Jovian years. So that one expunction is due in every period of $85\frac{45}{211}$ solar years. But since it really takes place according to the rule explained above, the interval between two expunctions is sometimes 85 and sometimes 86 years.

55. Generally speaking the samvatsara which is current at the beginning of a year is in practice coupled with all the days of that year, notwithstanding that another samvatsara may have begun during the course of the year. Indeed if there were no such practice there would be no occasion for an expunction. Epigraphical and other instances, however, have been found in which the actual samvatsara for the time is quoted with dates, notwithstanding that another samvatsara was current at the beginning of the year.[1]

56. *Variations*. As the length of the solar year and year of Jupiter differs with different *Siddhântas* it follows that the expunction of samvatsaras similarly varies.

57. Further, since a samvatsara is expunged when two samvatsaras begin in the same year, these expunctions will differ with the different kinds of year. Where luni-solar years are in use it is only natural to suppose that the rule will be made applicable to that kind of year, an expunction occurring when two samvatsaras begin in such a year; and there is evidence to show that in some places at least, such was actually the case for a time. Now the length of an ordinary luni-solar year (354 days) is less than that of a Jovian year (361 days), and therefore the beginning of two consecutive samvatsaras can only occur in those luni-solar years in which there is an intercalary month. Again, the solar year sometimes commences with the *mean* Mesha-sankrânti, and this again gives rise to a difference.[2]

The *Jyotisha-tattva* rule *(given below Art. 59)* gives the samvatsara current at the time of the *mean*, not of the *apparent*, Mesha-sankrânti, and hence all expunctions calculated thereby must be held to refer to the solar year only when it is taken to commence with the mean Mesha-sankrânti.[3] It is important that this should be remembered.

[1] See *Ind. Ant.*, Vol. XIX., pp. 27, 33, 187.

[2] These points have not yet been noticed by any European writer on Indian Astronomy. [S. B. D.]

[3] As to the mean Mesha-sankrânti, see *Art.* 26 above.

58. *To find the current samvatsara.* The samvatsaras in our Table I., col. 7, are calculated by the *Sûrya-Siddhânta* without the bîja up to A.D. 1500, and with the bîja from A.D. 1501 to 1900; and are calculated from the *apparent* Mesha-saṅkrânti. If the samvatsara current on a particular day by some other authority is required, calculations must be made direct for that day according to that authority, and we therefore proceed to give some rules for this process.

59. *Rules for finding the Bârhaspatya samvatsara current on a particular day.*[1]

*a. By the Sûrya-Siddhânta.*[2] Multiply the expired Kali year by 211. Subtract 108 from the product. Divide the result by 18000. To the quotient, excluding fractions, add the numeral of the expired Kali year plus 27. Divide the sum by 60. The remainder, counting from Prabhava as 1, is the samvatsara current at the beginning of the given solar year, that is at its apparent Mesha-saṅkrânti. Subtract from 18000 the remainder previously left after dividing by 18000. Multiply the result by 361, and divide the product by 18000. Calculate for days, ghaṭikâs, and palas. Add 15 palas to the result. The result is then the number of days, etc., elapsed between the apparent Mesha-saṅkrânti and the end of the samvatsara current thereon. By this process can be found the samvatsara current on any date.

*Example 1.*—Wanted the samvatsara current at the beginning of Saka 233 expired and the date on which it ended. Śaka 233 expired = (Table I.) Kali 3412 expired. $\frac{3412 \times 211 - 108}{18000} = 39\frac{17824}{18000}$. $39 + 3412 + 27 = 3478$. $\frac{3478}{60} = 57\frac{58}{60}$. The remainder is 58; and we have it that No. 58 Raktâkshin (*Table XII.*) was the samvatsara current at the beginning (apparent Mesha-saṅkrânti) of the given year. Again; $18000 - 17824 = 176$. $\frac{176 \times 361}{18000} = 3$ d. 31 gh. 47.2 p. Adding 15 pa. we have 3 d. 32 gh. 2.2 pa. This shews that Raktâkshin will end and Krodhana (No 59) begin 3 d. 32 gh. 2.2 pa. after the apparent Meska saṅkrânti. This last, by the *Sûrya Siddhânta*, occurred on 17th March, A.D. 311, at 27 gh. 23 pa. (*see Table I., col. 13, and the Table in Art. 96*), and therefore Krodhana began on the 20th March at 59 gh. 25.2 pa., or 34.8 palas before mean sunrise on 21st March. We also know that since Krodhana commences within four days after Mesha it will be expunged (*Art. 54 above.*)

*b. By the Ârya Siddhânta.* Multiply the expired Kali year by 22. Subtract 11 from the product. Divide the result by 1875. To the quotient excluding fractions add the expired Kali year + 27. Divide the sum by 60. The remainder, counted from Prabhava as 1, is the samvatsara current at the beginning of the given solar year. Subtract from 1875 the remainder previously left after dividing by 1875. Multiply the result by 361. Divide the product by 1875. Add 1 gh. 45 pa. to the quotient. The result gives the number of days, etc., that have elapsed between the apparent Mesha-saṅkrânti and the end of the samvatsara current thereon.

*Example 2.*—Required the samvatsara current at the beginning of Śaka 230 expired, and the time when it ended.

Śaka 230 expired = Kali 3409 expired. $\frac{3409 \times 22 - 11}{1875} = 39\frac{1862}{1875}$. $39 + 3409 + 27 = 3475$, which, divided by 60, gives the remainder 55. Then No. 55 Durmati (*Table XII.*) was current at the beginning of the given year. Again; $1875 - 1862 = 13$. $\frac{13 \times 361}{1875} = 2$ d. 30 gh. 10.56 pa. Adding 1 gh.

[1] By all these rules the results will be correct within two ghaṭikâs where the moment of the Mesha-saṅkrânti according to the authority used is known.

[2] The rule for the present *Vasishtha*, the *Śâkalya Brahma*, the *Romaka*, and the *Soma Siddhântas* is exactly the same. That by the original *Sûrya-Siddhânta* is also similar, but in that case the result will be incorrect by about 2 ghaṭikâs (48 minutes). For all these authorities take the time of the Mesha-saṅkrânti by the present *Sûrya-Siddhânta* or by the *Ârya Siddhânta*, whichever may be available. The moment of the Mesha-saṅkrânti according to the *Sûrya-Siddhânta* is given in our Table I. only for the years A.D. 1100 to 1900. The same moment for all years between A.D. 300 and 1100 can be found by the Table in Art. 96. If the *Ârya-Siddhânta* saṅkrânti is used for years A.D. 300 to 1100 the result will never be incorrect by more than 2 ghaṭikâs 45 palas (1 hour and 6 minutes). The Table should be referred to.

45 pa., we get 2 d. 31 gh. 55.56 pa. Add this to the moment of the Mesha saṅkrânti as given in Table I., cols. 13—16, viz., 16th March, 308 A.D., Tuesday, at 41 gh. 40 p., and we have 19th March, Friday, 13 gh. 35.56 p. after mean sunrise as the moment when Durmati ends and Dundubhi begins. Here again, since Dundubhi commences within four days of the Mesha saṅkrânti, it will be expunged.

*c. By the Sûrya-Siddhânta with the bîja (to be used for years after about 1500 A.D.).* Multiply the expired Kali year by 117. Subtract 60 from the product. Divide the result by 10000. To the figures of the quotient, excluding fractions, add the number of the expired Kali year plus 27. Divide the sum by 60. And the remainder, counted from Prabhava as 1, is the samvatsara current at the beginning of the given solar year. Subtract from 10000 the remainder left after the previous division by 10000. Multiply the difference by 361, and divide the product by 10000. Add 15 pa. The result is the number of days, etc., that have elapsed between the apparent Mesha saṅkrânti and the end of the samvatsara current thereon. [1]

*Example.*—Required the samvatsara current at the beginning of Śaka 1436 expired, and the moment when it ends. Śaka 1436 expired = Kali 4615 expired (Table I.). $\frac{4615 \times 117 - 60}{10000} = 53\frac{9895}{10000}$ $\frac{53 + 4615 + 27}{60} = 78\frac{15}{60}$. The remainder 15 shews that Vṛisha was current at the Mesha-saṅkrânti. $\frac{(10000 - 9895) \cdot 361}{10000}$ + 15 p. = 3 d. 47 gh. 25.8 p. + 15 p. = 3 d. 47 gh. 40.8 p. Table I. gives the Mesha-saṅkrânti as March 27th, 44 gh. 25 p., Monday. 27 d. 44 gh. 25 p. + 3 d. 47 gh. 40.8 p. = 31 d. 32 gh. 5.8 p.; and this means that Vṛisha ended at 32 gh. 5.8 p. after mean sunrise at Ujjain on Friday, 31st March. At that moment Chitrabhânu begins, and since it began within four days of the Mesha-saṅkrânti, it is expunged.

*d. Bṛihatsamhitâ and Jyotishatattva Rules.* The rules given in the *Bṛihatsamhitâ* and the *Jyotishatattva* seem to be much in use, and therefore we give them here. The *Jyotishatattva* rule is the same as that for the *Ârya-Siddhânta* given above, except that it yields the year current at the time of mean Mesha-saṅkranti, and that it is adapted to Śaka years. The latter difference is merely nominal of course, as the moment of the beginning of a samvatsara is evidently the same by both. [2] We have slightly modified the rules, but in words only and not in sense.

The *Jyotishatattva* rule is this. Multiply the current Śaka year by 22. Add 4291. Divide the sum by 1875. To the quotient excluding fractions add the number of the current Śaka year. Divide the sum by 60. The remainder, counted from Prabhava as 1, is the samvatsara current at the beginning of the given year. Subtract the remainder left after previously dividing by 1875 from 1875. Multiply the result by 361. And divide the product by 1875. The result gives the number of days by which, according to the *Ârya-Siddhânta*, the samvatsara ends after mean Mesha-saṅkrânti. The mean [3] Mesha-saṅkranti will be obtained by adding 2d. 8 gh. 51 pa. 15 vipa. to the time given in Table I., cols. 13 to 18.

Work out by this rule the example given above under the *Ârya-Siddhânta* rule, and the result will be found to be the same by both.

*The Bṛihatsamhitâ rule.* Multiply the expired Śaka year by 44. Add 8589. Divide the sum by 3750. To the quotient, excluding fractions, add the number of the expired Śaka year

[1] In these three rules the apparent Mesha-saṅkrânti is taken. If we omit the subtraction of 108, 11, and 60, and do not add 15 p., 1 gh. 45 p., and 15 p. respectively, the result will be correct with respect to the mean Mesha-saṅkrânti.

[2] I have not seen the *Jyotishatattva* (or "*Jyotishtava*" as Warren calls it, but which seems to be a mistake), but I find the rule in the *Ratnamâlâ* of Śrîpati (A.D. 1039). It must be as old as that by the *Ârya-Siddhânta*, since both are the same. [S. B. D.]

[3] If we add 4280 instead of 4291, and add 1 gh. 45 pa. to the final result, the time so arrived at will be the period elapsed since apparent Mesha-saṅkranti. Those who interpret the *Jyotishatattva* rule in any different way have failed to grasp its proper meaning. [S. B. D.]

plus 1. Divide the sum by 60. The remainder, counted from Prabhava as 1, is the samvatsara current at the beginning of the year. Subtract from 3750 the remainder obtained after the previous division by 3750. Multiply the result by 361, and divide the product by 3750. This gives the number of days by which the samvatsara current at the beginning of the year will end after the Mesha saṅkranti.[1]

60. *List of Expunged Samvatsaras.* The following is a comparative list of expunged samvatsaras as found by different authorities, taking the year to begin at the mean Mesha saṅkrânti.

**List of Expunged Samvatsaras.**[2]

| *First Ârya-Siddhânta, Bṛihat-saṁhitâ, Ratnamâlâ, Jyotiskatattva* Rules. | | | *Sûrya-Siddhânta* Rule without *bîja* up to 1500 A.D., and with *bîja* afterwards. | | | *First Ârya-Siddhânta, Bṛihat-saṁhitâ, Ratnamâlâ, Jyotiskatattva* Rules. | | | *Sûrya-Siddhânta* Rule without *bîja* up to 1500 A.D., and with *bîja* afterwards. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Śaka year current. | A. D. | Expunged Samvatsara. | Śaka year current. | A. D. | Expunged Samvatsara. | Śaka year current. | A. D. | Expunged Samvatsara. | Śaka year current. | A. D. | Expunged Samvatsara. |
| 232 | 309–10 | 57 Rudhirodgârin | 234 | 311–12 | 59 Krodhana | 1084 | 1161–62 | 19 Pârthiva | 1087 | 1164–65 | 22 Sarvadhârin |
| 317 | 394–95 | 23 Virodhin | 319* | 396–97 | 25 Khara | 1169 | 1246–47 | 45 Virodhakṛit | 1172* | 1249–50 | 48 Ânanda |
| 402 | 479–80 | 49 Râkshasa | 404* | 481–82 | 51 Piṅgala | 1254 | 1331–32 | 11 Îśvara | 1258 | 1335–36 | 15 Vṛisha |
| 487 | 564–65 | 15 Vṛisha | 490 | 567–68 | 18 Târaṇa | 1340 | 1417–18 | 38 Krodhin | 1343 | 1420–21 | 41 Plavaṅga |
| 572 | 649–50 | 41 Plavaṅga | 575* | 652–53 | 44 Sâdhâraṇa | 1425 | 1502–03 | 4 Pramoda | 1437 | 1514–15 | 16 Chitrabhânu |
| 658 | 735–36 | 8 Bhava | 660* | 737–38 | 10 Dhâtṛi | 1510 | 1587–88 | 30 Durmukha | 1522* | 1599–1600 | 42 Kîlaka |
| 743 | 820–21 | 34 Śârvarî | 746 | 823–24 | 37 Śobhana | | | | | | |
| 828 | 905–06 | 60 Kshaya | 831 | 908–09 | 3 Śukla | 1595 | 1672–73 | 56 Dundubhi | 1608 | 1685–86 | 9 Yuvan |
| 913 | 990–91 | 26 Nandana | 916* | 993–94 | 29 Manmatha | 1680 | 1757–58 | 22 Sarvadhârin | 1693* | 1770–71 | 35 Plava |
| 999 | 1076–77 | 53 Siddhârthin | 1002 | 1079–80 | 56 Dundubhi | 1766 | 1843–44 | 49 Râkshasa | 1779 | 1856–57 | 2 Vibhava |

If we take the years to commence with the apparent Mesha-saṅkrânti the samvatsaras expunged by *Sûrya Siddhânta* calculation will be found in Table I., col. 7; and those by the *Ârya Siddhânta* can be found by the rule for that *Siddhânta* given in *Art. 59* above.

61. The years of Jupiter's cycle are not mentioned in very early inscriptions. They are mentioned in the *Sûrya-Siddhânta*. Dr. J. Burgess states that he has reason to think that they were first introduced about A.D. 349, and that they were certainly in use in A.D. 530. We have therefore given them throughout in Table I.

62. *The southern (luni-solar) sixty-year cycle.* The sixty-year cycle is at present in daily use in Southern India (south of the Narmadâ), but there the samvatsaras are made to correspond with the luni-solar year as well as the solar; and we therefore term it the luni-solar 60-year cycle in contradistinction to the more scientific Bârhaspatya cycle of the North.

1 It is not stated what Mesha-saṅkrânti is meant, whether mean or apparent. The rule is here given as generally interpreted by writers both Indian and European, but in this form its origin cannot be explained. I am strongly inclined to think that Varâhamihira, the author of the *Bṛihatsaṁhitâ*, meant the rule to run thus. "Multiply the current Saka year by 44. Add 8589 (or 8581 or 8583). Divide the sum by 3750. To the integers of the quotient add the given current Saka year, (and the rest as above). The result is for the mean Mesha-saṅkranti." In this form it is the same as the *Ârya-Siddhânta* or the *Jyotishatattva* rule, and can be easily explained. (S. B. D.)

2 In this Table the *Bṛihatsaṁhitâ* rule is worked as I interpret it. But as interpreted by others the expunctions will differ, the differences being in Saka (current) 231, the 56th; 998, the 52nd; 1339, the 37th.

By the *Sûrya Siddhânta* the years marked with an asterisk in the Saka column of this Table differ from those given in Table I., col. 7, being in each case one earlier, the rest are the same. (S. B. D.)

There is evidence [1] to show that the cycle of Jupiter was in use in Southern India before Saka 828 (A.D. 905-6); but from that year, according to the *Ârya Siddhânta*, or from Saka 831 (A.D. 908-9) according to the *Sûrya-Siddhânta*, the expunction of the samvatsaras was altogether neglected, with the result that the 60-year cycle in the south became luni-solar from that year. At present the northern samvatsara has advanced by 12 on the southern. There is an easy rule for finding the samvatsara according to the luni-solar cycle, viz., add 11 to the current Saka year, and divide by 60; the remainder is the corresponding luni-solar cycle year. It must not be forgotten that the samvatsaras of Jupiter's and the southern cycle, are always to be taken as current years, not expired.

63. *The twelve-year cycle of Jupiter.* There is another cycle of Jupiter consisting of twelve samvatsaras named after the lunar months. It is of two kinds. In one, the samvatsara begins with the heliacal rising [2] of Jupiter and consists of about 400 solar days, one samvatsara being expunged every 12 years or so. [3] In the other, which we have named the "twelve-year cycle of Jupiter of the mean-sign system", the years are similar in length to those of the sixty-year cycle of Jupiter just described, and begin at the same moment. Both kinds, though chiefly the former, were in use in early times, and the latter is often employed in modern dates, especially in those of the Kollam era. The samvatsaras of this heliacal rising system can only be found by direct calculations according to some *Siddhânta*. The correspondence of the samvatsaras of the mean-sign system with those of the sixty-year cycle are given in Table XII. They proceed regularly.

64. *The Graha-parivṛitti and Oṅko cycles.* There are two other cycles, but they are limited to small tracts of country and would perhaps be better considered as eras. We however give them here.

The southern inhabitants of the peninsula of India (chiefly of the Madura district) use a cycle of 90 solar years which is called the *Graha-parivṛitti*. Warren has described the cycle, deriving his information from the celebrated Portuguese missionary Beschi, who lived for over forty years in Madura. The cycle consists of 90 solar years, the length of one year being 365 d. 15 gh. 31 pa. 30 vi., and the year commences with Mesha. Warren was informed by native astronomers at Madras that the cycle consisted of the sum in days of 1 revolution of the sun, 15 of Mars, 22 of Mercury, 11 of Jupiter, 5 of Venus and 29 of Saturn, though this appears to us quite meaningless. The length of this year is that ascertained by using the original *Sûrya-Siddhânta*; but from the method given by Warren for finding the beginning of the years of this cycle it appears that astronomers have tried to keep it as nearly as possible in agreement with calculations by the *Ârya-Siddhânta*, and in fact the year may be said to belong to the *Ârya-Siddhânta*. The cycle commenced with Kali 3079 current (B. C. 24) and its epoch, *i.e.*, the Graha-parivṛitti year 0 current [4] is Kali 3078 current (B. C. 25).

1 See *Corpus Inscrip. Indic.*, Vol. III., p. 80, note; *Ind. Antiq.*, *XVII.*, p. 142

2 The heliacal rising of a superior planet is its first *visible* rising after its conjunction with the sun, *i.e.*, when it is at a sufficient distance from the sun to be first seen on the horizon at its rising in the morning before sunrise, or, in the case of an inferior planet (Mercury or Venus), at its setting in the evening after sunset. For Jupiter to be visible the sun must be about 11° below the horizon. [R. S.]

3 It is fully described by me in the Indian Antiquary, vol. XVII. [S. B. D.]

4 In practice of course the word "current" cannot be applied to the year 0, but it is applied here to distinguish it from the year 0 complete or expired, which means year 1 current. We use the word "epoch" to mean the year 0 current. The epoch of an era given in a year of another era is useful for turning years of one into years of another era. Thus, by adding 3078 (the number of the Kali year corresponding to the Graha-parivṛitti cycle epoch) to a Graha-parivṛitti year, we can get the equivalent Kali year, and by subtracting the same from a Kali year we get the corresponding Graha-parivṛitti year.

To find the year of the Graha-parivṛitti cycle, add 72 to the current Kali-year, 11 to the current Saka year, or 24 or 23 to the A.D. year, viz., 24 from Mesha to December 31st, and 23 from January 1st to Mesha; divide by 90 and the remainder is the current year of the cycle.

The Oṅko[1] cycle of 59 luni-solar years is in use in part of the Ganjam district of the Madras Presidency. Its months are pûrṇimânta, but it begins the year on the 12th of Bhâdrapada-śuddha,[2] calling that day the 12th not the 1st. In other words, the year changes its numerical designation every 12th day of Bhâdrapada-suddha. It is impossible as yet to say decidedly when the Oṅko reckoning commenced. Some records in the temple of Jagannātha at Puri (perfectly valueless from an historical point of view) show that it commenced with the reign of Subhānideva in 319 A.D., but the absurdity of this is proved by the chronicler's statement that the great Mughal invasion took place in 327 A.D. in the reign of that king's successor.[3] Some say that the reckoning commenced with the reign of Choḍagaṅga or Chorgaṅga, the founder of the Gāṅgavaṁśa, whose date is assigned usually to 1131-32 A.D., while Sutton in his *History of Orissa* states that it was introduced in 1580 A.D. In the zamindari tracts of Parlakimeḍi, Peddakimeḍi and Chinnakimeḍi the *Oṅko* Calendar is followed, but the people there also observe each a special style, only differing from the parent style and from one another in that they name their years after their own zamindars. A singular feature common to all these four kinds of regnal years is that, in their notation, the years whose numeral is 6, or whose numerals end with 6 or 0 (except 10), are dropped.[4] For instance, the years succeeding the 5th and 19th Oṅkos of a prince or zamindar are called the 7th and 21st Oṅkos respectively. It is difficult to account for this mode of reckoning; it may be, as the people themselves allege, that these numerals are avoided because, according to their traditions and *śâstras*, they forebode evil, or it may possibly be, as some might be inclined to suppose, that the system emanated from a desire to exaggerate the length of each reign. There is also another unique convention according to which the Oṅko years are not counted above 59, but the years succeeding 59 begin with a second series, thus "second 1", "second 2", and so on. It is also important to note that when a prince dies in the middle of an Oṅko year, his successor's 1st Oṅko which commences on his accession to the throne, does not run its full term of a year, but ends on the 11th day of Bhâdrapada-suddha following; consequently the last regnal year of the one and the first of the other together occupy only one year, and one year is dropped in effect. To find, therefore, the English equivalent of a given Oṅko year, it will be necessary first to ascertain the style to which it relates, *i.e.*, whether it is a Jagannātha Oṅko or a Parlakimeḍi Oṅko, and so on; and secondly to value the given year by excluding the years dropped (namely, the 1st—possibly, the 6th, 16th, 20th, 26th, 30th, 36th, 40th, 46th, 50th, 56th). There are lists of Orissa princes available, but up to 1797 A.D. they would appear to be perfectly inauthentic.[5] The list from

1 Or *Aṅka*.

2 On the 11th according to some, but all the evidence tends to shew that the year begins on the 12th.

3 The real date of the Muhammadan invasion seems to be 1568 A.D. (J. A. S. B. for 1883, LII., p. 233, *note*). The invasion alluded to is evidently that of the "Yavanas", but as to these dates these temple chronicles must never be believed. [R. S.]

4 Some say that the first year is also dropped, similarly; but this appears to be the result of a misunderstanding, this year being dropped only to fit in with the system described lower down in this article. Mr J. Beames states that "the first two years and every year that has a 6 or a 0 in it are omitted", so that the 37th Oṅko of the reign of Râmachandra is really his 28th year, since the years 1, 2, 6, 10, 16, 20, 26, 30 and 36 are omitted (J. A. S. B. 1883, LII., p. 234, *note*. He appears to have been misled about the first two years.

5 Sewell's *Sketch of the Dynasties of Southern India*, p. 64. *Archæological Survey of Southern India*, vol. II., p. 204.

that date forwards is reliable, and below are given the names of those after whom the later Oṅko years have been numbered, with the English dates corresponding to the commencement of the 2nd Oṅkos of their respective reigns.

| | | | | |
|---|---|---|---|---|
| Oṅko 2 of Mukundadeva . . . . | September 2, 1797. | (Bhâdrapada | sukla 12th.) |
| Do. Râmachandradeva . . . | September 22, 1817. | Do. | Do. |
| Do. Vîrakeśvaradeva . . . | September 4, 1854. | Do. | Do. |
| Do. Divyasiṁhadeva . . . | September 8, 1859. | Do. | Do. |

## PART II.

## THE VARIOUS ERAS.

65. *General remarks.* Different eras have, from remote antiquity, been in use in different parts of India, having their years luni-solar or solar, commencing according to varying practice with a given month or day; and in the case of luni-solar years, having the months calculated variously according to the amânta or pûrṇimânta system of pakshas. *(Art. 12 above).* The origin of some eras is well known, but that of others has fallen into obscurity. It should never be forgotten, as explaining at once the differences of practice we observe, that when considering "Indian" science we are considering the science of a number of different tribes or nationalities, not of one empire or of the inhabitants generally of one continent.

66. If a number of persons belonging to one of these nationalities, who have been in the habit for many years of using a certain era with all its peculiarities, leave their original country and settle in another, it is natural that they should continue to use their own era, notwithstanding that another era may be in use in the country of their adoption; or perhaps, while adopting the new era, that they should apply to it the peculiarities of their own. And *vice versâ* it is only natural that the inhabitants of the country adopted should, when considering the peculiarities of the imported era, treat it from their own stand-point.

67. And thus we actually find in the pañchâṅgs of some provinces a number of other eras embodied, side by side with the era in ordinary use there, while the calendar-makers have treated them by mistake in the same or nearly the same manner as that of their own reckoning. For instance, there are extant solar pañchâṅgs of the Tamil country in which the year of the Vikrama era is represented as a solar Meshâdi year. And so again Śaka years are solar in Bengal and in the Tamil country, and luni-solar in other parts of the country. So also we sometimes find that the framers of important documents have mentioned therein the years of several eras, but have made mistakes regarding them. In such a case we might depend on the dates in the document if we knew exactly the nationality of the authors, but very often this cannot be discovered, and then it is obviously unsafe to rely on it in any sense as a guide. This point should never be lost sight of.

68. Another point to be always borne in mind is that, for the sake of convenience in calculation a year of an era is sometimes treated differently by different authors in the same province, or indeed even by the same author. Thus, Gaṇeśa Daivajña makes Śaka years begin

with Chaitra śukla pratipadâ in his *Grahalâghava* (A.D. 1520), but with mean Mesha saṅkrânti in his *Tithichintâmaṇi* (A.D. 1525.)

69. It is evident therefore that a certain kind of year, *e.g.*, the solar or luni-solar year, or a certain opening month or day, or a certain arrangement of months and fortnights and the like, cannot be strictly defined as belonging exclusively to a particular era or to a particular part of India. We can distinctly affirm that the eras whose luni-solar years are Chaitrâdi (*i.e.*, beginning with Chaitra śukla pratipadâ) are always Meshâdi (beginning with the Mesha saṅkrânti) in their corresponding solar reckoning, but beyond this it is unsafe to go.

70. *Current and expired years.* It is, we believe, now generally known what an "expired" or "current" year is, but for the benefit of the uninitiated we think it desirable to explain the matter fully. Thus; the same Śaka year (A.D. 1894) which is numbered 1817 *vartamâna*, or astronomically current, in the pañchâṅgs of the Tamil countries of the Madras Presidency, is numbered 1816 *gata* ("expired") in other parts of India. This is not so unreasonable as Europeans may imagine, for they themselves talk of the third furlong after the fourth mile on a road as "four miles three furlongs" which means three furlongs after the expiry of the fourth mile, and the same in the matter of a person's age; and so September, A.D. 1894, (Śaka 1817 current) would be styled in India "Śaka 1816 expired, September", equivalent to "September after the end of Saka 1816" or "after the end of 1893 A.D". Moreover, Indian reckoning is based on careful calculations of astronomical phenomena, and to calculate the planetary conditions of September, 1894, it is necessary first to take the planetary conditions of the end of 1893, and then add to them the data for the following nine months. That is, the end of 1893 is the basis of calculation. It is always necessary to bear this in mind because often the word *gata* is omitted in practice, and it is therefore doubtful whether the real year in which an inscription was written was the one mentioned therein, or that number decreased by one. [1]

In this work we have given the corresponding years of the Kali and Saka eras actually current, and not the expired years. This is the case with all eras, including the year of the *Vikrama* [2] era at present in use in Northern India.

71. *Description of the several eras.* In Table II., Part iii., below we give several eras, chiefly those whose epoch is known or can be fixed with certainty, and we now proceed to describe them in detail.

*The Kali-Yuga.*—The moment of its commencement has been already given (*Art. 16 above*). Its years are both Chaitrâdi (luni-solar) and Meshâdi (solar.) It is used both in astro-

[1] See "*Calculations of Hindu dates*", by Dr. Fleet, in the *Ind. Ant.*, vols. *XVI.* to *XIX.*, and my notes on the date of a Jain *Purâṇa* in Dr. Bhândârkar's "*Report on the search for Sanskrit manuscripts*" for 1883—1884 A. D., p.p. 429—30 §§ 36, 37. [S. B. D.]

[2] The Vikrama era is never used by Indian astronomers. Out of 150 Vikrama dates examined by Dr. Kielhorn (*Ind. Ant.*, XIX.), there are only six which have to be taken as current years. Is it not, however, possible that all Vikrama years are really current years, but that sometimes in writings and inscriptions the authors have made them doubly current in consequence of thinking them erroneously to be expired years. There is an instance of a Saka year made twice current in an inscription published in the *Ind. Ant.*, (vol. XX., p. 191). The year was already 1155 *current*, but the number given by the writer of the inscription is 1156, as if 1155 had been the expired year.

As a matter of fact I do not think that it is positively known whether the years of the Christian era are themselves really expired or current years. Warren, the author of the *Kâlasankalita* was not certain. He calls the year corresponding to the Kali year 3101 expired "A. D. 0 complete" (p. 302) or "1 current" (p. 294). Thus, by his view, the Christian year corresponding to the Kali year 3102 expired would be A. D. 1 complete or A. D. 2 current. But generally European scholars fix A. D. 1 current as corresponding to Kali 3102 expired. The current and expired years undoubtedly give rise to confusion. The years of the astronomical eras, the Kali and Saka for instance, may, unless the contrary is proved, be assumed to be expired years, and those of the non-astronomical eras, such as the Vikrama, Gupta, and many others, may be taken as current ones. (See, however, Note 3, p. 42, below.) [S. B. D.]

nomical works and in pañchâṅgs. In the latter sometimes its expired years, sometimes current years are given, and sometimes both. It is not often used in epigraphical records.[1]

*Saptarshi-Kâla.*—This era is in use in Kashmir and the neighbourhood. At the time of Alberuni (1030 A.D.), it appears to have been in use also in Multân and some other parts. It is the only mode of reckoning mentioned in the *Râja-Taraṅgiṇî*. It is sometimes called the "Laukika-Kâla" and sometimes the "Śâstra-Kâla". It originated on the supposition that the seven Ṛishis (the seven bright stars of Ursa Major) move through one nakshatra (27th part of the ecliptic) in 100 years, and make one revolution in 2700 years; the era consequently consists of cycles of 2700 years. But in practice the hundreds are omitted, and as soon as the reckoning reaches 100, a fresh hundred begins from 1. Kashmirian astronomers make the era, or at least one of its cycles of 2700 years, begin with Chaitra sukla 1st of Kali 27 current. Disregarding the hundreds we must add 47 to the Saptarshi year to find the corresponding current Saka year, and 24—25 for the corresponding Christian year. The years are Chaitrâdi. Dr. F. Kielhorn finds[2] that they are mostly current years, and the months mostly pûrṇimânta.

*The Vikrama era.*—In the present day this era is in use in Gujarât and over almost all the north of India, except perhaps Bengal.[3] The inhabitants of these parts, when migrating to other parts of India, carry the use of the era with them. In Northern India the year is Chaitrâdi, and its months pûrṇimânta, but in Gujarât it is Kârttikâdi and its months are amânta. The settlers in the Madras Presidency from Northern India, especially the Mârvâḍis who use the Vikrama year, naturally begin the year with Chaitra śukla pratipadâ and employ the pûrṇimânta scheme of months; while immigrants from Gujarât follow their own scheme of a Kârttikâdi amânta year, but always according to the Vikrama era. In some parts of Kâṭhiâvâḍ and Gujarât the Vikrama era is Âshâḍhâdi[4] and its months amânta. The practice in the north and south leads in the present day to the Chaitrâdi pûrṇimânta Vikrama year being sometimes called the "Northern Vikrama," and the Kârttikâdi amânta Vikrama year the "Southern Vikrama,"

The correspondence of these three varieties of the Vikrama era with the Saka and other eras, as well as of their months, will be found in Table II., Parts ii. and iii.

Prof. F. Kielhorn has treated of this era at considerable length in the *Ind. Antiq.*, vols. XIX. and XX., and an examination of 150 different dates from 898 to 1877 of that era has led him to the following conclusions *(ibid., XX., p. 398 ff.)*.

(1) It has been at all times the rule for those who use the Vikrama era to quote the expired years, and only exceptionally[5] the current year.

(2) The Vikrama era was Kârttikâdi from the beginning, and it is probable that the change which has gradually taken place in the direction of a more general use of the Chaitrâdi year was owing to the increasing growth and influence of the Śaka era. Whatever may be the practice in quite modern times, it seems certain that down to about the 14th century of the Vikrama era both kinds of years, the Kârttikâdi and the Chaitrâdi, were used over exactly the same tracts of country, but more frequently the Kârttikâdi.

(3) While the use of the Kârttikâdi year has been coupled with the pûrṇimânta as often as with the

1 *Corpus Inscrip. Ind., Vol. III., Introduction, p. 69, note.*

2 *Ind. Ant.*, Vol. XX., p. 149 ff.

3 In Bengâlî pañchâṅgs the Vikrama Samvat, or Sumbut, is given along with the Śaka year, and, like the North-Indian Vikrama Samvat, is Chaitrâdi pûrṇimânta.

4 See *Ind. Ant., vol. XVII., p. 93*; also note 3, p. 31, and connected Text.

5 See, however, note 2 on the previous page.

amânta scheme of months, the Chaitrâdi year is found to be more commonly joined with the pûrṇimânta scheme: but neither scheme can be exclusively connected with either the Kârttikâdi or Chaitrâdi year.

The era was called the "Mâlava" era from about A.D. 450 to 850. The earliest known date containing the word "Vikrama" is Vikrama-samvat 898 (about A.D. 840); but there the era is somewhat vaguely described as "the time called Vikrama"; and it is in a poem composed in the Vikrama year 1050 (about A.D. 992) that we hear for the first time of a king called Vikrama in connection with it. (See *Ind. Antiq.*, XX., p. 404).

At the present day the Vikrama era is sometimes called the "Vikrama-samvat", and sometimes the word "samvat" is used alone as meaning a year of that era. But we have instances in which the word "samvat" (which is obviously an abbreviation of the word *samvatsara*, or year) is used to denote the years of the Śaka, Siṁha, or Valabhi eras [1] indiscriminately.

In some native pañchâṅgs from parts of the Madras presidency and Mysore for recent years the current Vikrama dates are given in correspondence with current Śaka dates; for example, the year corresponding to A.D. 1893—94 is said to be Śaka 1816, or Vikrama 1951. (*See remarks on the Śaka era above.*)

*The Christian era.* This has come into use in India only since the establishment of the English rule. Its years at present are tropical solar commencing with January 1st, and are taken as current years. January corresponds at the present time with parts of the luni-solar amânta months Mârgaśirsha and Pausha, or Pausha and Mâgha. Before the introduction of the new style, however, in 1752 A.D., it coincided with parts of amânta Pausha and Mâgha, or Mâgha and Phâlguna. The Christian months, as regards their correspondence with luni-solar and solar months, are given in Table II., Part ii.

*The Śaka era.*—This era is extensively used over the whole of India; and in most parts of Southern India, except in Tinnevelly and part of Malabar, it is used exclusively. In other parts it is used in addition to local eras. In all the *Karaṇas*, or practical works on astronomy it is used almost exclusively. [2] Its years are Chaitrâdi for luni-solar, and Meshâdi for solar, reckoning. Its months are pûrṇimânta in the North and amânta in Southern India. Current years are given in some pañchâṅgs, but the expired years are in use in most [3] parts of India.

*The Chedi* or *Kalachuri era.*—This era is not now in use. Prof. F. Kielhorn, examining the dates contained in ten inscriptions of this era from 793 to 934, [4] has come to the conclusion

[1] See *Ind. Ant.*, vol. XII., pp. 213, 293; XI., p. 242 *f.*

[2] I have seen only two examples in which authors of *Karaṇas* have used any other era along with the Śaka. The author of the *Râma-vinoda* gives, as the starting-point for calculations, the Akbar year 35 together with the Śaka year 1512 (expired), and the author of the *Phattesâhaprakâśa* fixes as its starting-point the 48th year of "Phattesâha" coupled with the Śaka year 1628. [S. B. D.]

[3] Certain Telugu (luni-solar) and Tamil (solar) pañchâṅgs for the last few years, which I have procured, and which were printed at Madras and are clearly in use in that Presidency, as well as a Canarese pañchâṅg for A.D. 1893, (Śaka 1816 current, 1815 expired) edited by the Palace Astronomer of H. H. the Mahârâjâ of Mysore, give the current Śaka years. But I strongly doubt whether the authors of these pañchâṅgs are themselves acquainted with the distinction between so-called current and expired years. For instance, there is a pañchâṅg annually prepared by Mr. Annu Ayyangâr, a resident of Kañjnûr in the Tanjore District, which appears to be in general use in the Tamil country, and in that for the solar Meshâdi year corresponding to 1887—88 he uses the expired Śaka year, calling this 1809, while in those for two other years that I have seen the current Śaka year is used. I have conversed with several Tamil gentlemen at Poona, and learn from them that in their part of India the generality of people are acquainted only with the name of the samvatsara of the 60-year cycle, and give no numerical value to the years. Where the years are numbered, however, the expired year is in general use. I am therefore inclined to believe that the so-called current Śaka years are nowhere in use; and it becomes a question whether the so-called expired Śaka year is really an expired one. [S. B. D.]

[4] *Indian Antiquary* for August, 1888, vol. XVII., p. 215, and the *Academy* of 10th Dec., 1887, p. 394 f. I had myself calculated these same inscription-dates in March, 1887, and had, in conjunction with Dr. Fleet, arrived at nearly the same conclusions as Dr. Kielhorn's, but we did not then settle the epoch, believing that the data were not sufficiently reliable. (*Corpus Inscrip. Indic.*, Vol. III., Introd., p. 9. [S. B. D.] See also Dr Kielhorn's Paper read before the Oriental Congress in London. [R. S.]

that the 1st day of the 1st *current* Chedi year corresponds to Aśvina śukla pratipadâ of Chaitrâdi Vikrama 306 current, (Śaka 171 current, 5th Sept., A.D. 248); that consequently its years are Âśvinâdi; that they are used as current years; that its months are pûrṇimânta; and that its epoch, *i.e.*, the beginning of Chedi year 0 current, is A. D. 247—48.

The era was used by the Kalachuri kings of Western and Central India, and it appears to have been in use in that part of India in still earlier times.

*The Gupta era.*—This era is also not now in use. Dr. Fleet has treated it at great length in the introduction to the *Corpus. Inscrip. Ind.* (Vol. III, "*Gupta Inscriptions*"), and again in the *Indian Antiquary* (Vol. XX., pp. 376 ff.) His examination of dates in that era from 163 to 386 leads him to conclude that its years are current and Chaitrâdi; that the months are pûrṇimânta; and that the epoch, *i.e.*, the beginning of Gupta Samvat 0 current, is Śaka 242 current (A. D. 319—20). The era was in use in Central India and Nepal, and was used by the Gupta kings.

The *Valabhi era.*—This is merely a continuation of the Gupta era with its name changed into "Valabhi." It was in use in Kâṭhiâvâḍ and the neighbourhood, and it seems to have been introduced there in about the fourth Gupta century. The beginning of the year was thrown back from Chaitra śukla 1st to the previous Kârttika śukla 1st, and therefore its epoch went back five months, and is synchronous with the current Kârttikâdi Vikrama year 376 (A.D. 318—19, Saka 241—42 current). Its months seem to be both amânta and pûrṇimânta.

The inscriptions as yet discovered which are dated in the Gupta and Valabhi era range from the years 82 to 945 of that era.

*The Bengali San.*—An era named the "Bengali San" (sometimes written in English "Sen") is in use in Bengal. It is a solar year and runs with the solar Śaka year, beginning at the Mesha saṅkrânti; but the months receive lunar-month names, and the first, which corresponds with the Tamil Chaitra, or with Mesha according to the general reckoning, is here called Vaiśâkha, and so on throughout the year, their Chaitra corresponding with the Tamil Phâlguna, or with the Mîna of our Tables. We treat the years as current ones. Bengali San 1300 current corresponds with Śaka 1816 current (A.D. 1893—94.) Its epoch was Śaka 516 current, A.D. 593—94. To convert a Bengali San date into a Śaka date for purposes of our Tables, add 516 to the former year, which gives the current Śaka solar year, and adopt the comparison of months given in Table II., Part. ii., cols. 8, 9.

*The Vilâyati year.*—This is another solar year in use in parts of Bengal, and chiefly in Orissa; it takes lunar-month names, and its epoch is nearly the same as that of the "Bengali San", viz., Saka 515—16 current, A.D. 592—93. But it differs in two respects. First, it begins the year with the solar month Kanyâ which corresponds to Bengal solar Âśvina or Âssin. Secondly, the months begin on the day of the saṅkrânti instead of on the following (2nd) or 3rd day *(see Art. 28, the Orissa Rule).*

*The Amli Era of Orissa*—This era is thus described in Giriśa Chandra's "*Chronological Tables*" (preface, p. xvi.): "The Amli commences from the birth of Indradyumna, Râjâ of Orissa, on Bhâdrapada śukla 12th, and each month commences from the moment when the sun enters a new sign. The *Amli San* is used in business transactions and in the courts of law in Orissa." [1]

[1] The Vilâyatî era, as given in some Bengal Government annual chronological Tables, and in a Bengali pañchâng printed in Calcutta that I have seen, is made identical with this Amli era in almost every respect, except that its months are made to commence civilly in accordance with the second variety of the midnight rule (*Art.* 28). But facts seem to be that the Vilâyatî year commences, not on lunar Bhâdrapada śukla 12th, but with the Kanyâ saṅkranti, while the Amli year does begin on lunar Bhâdrapada śukla 12th It may be remarked that Warren writes—in A.D 1825—(*Kâlasankalita, Tables p. I.I.*) that the "Vilaity year is reckoned from the 1st of the krishna paksha in Chaitra", and that its numerical designation is the same with the Bengali San. [S. B. D.]

It is thus luni-solar with respect to changing its numerical designation, but solar as regards the months and days. But it seems probable that it is really luni-solar also as regards its months and days.

The Kanyâ saṅkrânti can take place on any day from about 11 days previous to lunar Bhâdrapada śukla 12th to about 18 days after it. With the difference of so many days the epoch and numerical designation of the Amli and Vilâyati years are the same.

*The Fasali year.*—This is the harvest year introduced, as some say, by Akbar, originally derived from the Muhammadan year, and bearing the same number, but beginning in July. It was, in most parts of India, a solar year, but the different customs of different parts of India caused a divergence of reckoning. Its epoch is apparently A. H. 963 (A. D. 1556), when its number coincided with that of the purely lunar Muhammadan year, and from that date its years have been solar or luni-solar. Thus (A. H.) 963 + 337 (solar years) = 1300, and (A. D.) 1556 + 337 = 1893 A.D., with a part of which year Fasali 1300 coincides, while the same year is A. H. 1310. The era being purely official, and not appealing to the feelings of the people of India, the reckoning is often found to be loose and unreliable. In Madras the Fasali year originally commenced with the 1st day of the solar month Âḍi (Karka), but about the year 1800 A.D. the British Government, finding that this date then coincided with July 13th, fixed July 13th as the permanent initial date; and in A.D. 1855 altered this for convenience to July 1st, the present reckoning. In parts of Bombay the Fasali begins when the sun enters the nakshatra Mṛigaśirsha, viz., (at present) about the 5th or 6th June. The Bengâli year and the Vilâyati year both bear the same number as the Fasali year.

The names of months, their periods of beginning, and the serial number of days are the same as in the Hijra year, but the year changes its numerical designation on a stated solar day. Thus the year is already a solar year, as it was evidently intended to be from its name. But at the present time it is luni-solar in Bengal, and, we believe, over all North-Western India, and this gives rise to a variety, to be now described.

*The luni-solar Fasali year.*—This reckoning, though taking its name from a Muhammadan source, is a purely Hindu year, being luni-solar, pûrṇimânta, and Âśvinâdi. Thus the luni-solar Fasali year in Bengal and N. W. India began (pûrṇimânta Âśvina kṛishṇa pratipadâ, Saka 1815 current =) Sept. 7th, 1882. A peculiarity about the reckoning, however, is that the months are not divided into bright and dark fortnights, but that the whole runs without distinction of pakshas, and without addition or expunction of tithis from the 1st to the end of the month, beginning with the full moon. Its epoch is the same as that of the Vilâyati year, only that it begins with the full moon next preceding or succeeding the Kanyâ saṅkrânti, instead of on the saṅkrânti day.

In Southern India the Fasali year 1302 began on June 5th, 1892, in Bombay, and on July 1st, 1892, in Madras. It will be seen, therefore, that it is about two years and a quarter in advance of Bengal.

To convert a luni-solar Bengali or N. W. Fasali date, approximately, into a date easily workable by our Tables, treat the year as an ordinary luni-solar pûrṇimânta year; count the days after the 15th of the month as if they were days in the śukla fortnight, 15 being deducted from the given figure; add 515 to make the year correspond with the Saka year, for dates between Âśvina 1st and Chaitra 15th (= amânta Bhâdrapada kṛishṇa 1st and amânta Phâlguna kṛishṇa 30th)—and 516 between Chaitra 15th and Âśvina 1st. Thus, let Chaitra 25th 1290 be the given date. The 25th should be converted into śukla 10th; adding 516 to 1290 we have 1806, the equivalent Śaka year. The corresponding Śaka date is therefore amânta Chaitra śukla 10th.

1806 current. From this the conversion to an A. D. date can be worked by the Tables. For an exact equivalent the saṅkrânti day must be ascertained.

*The Mahratta Sûr-san or Shahûr-san.*—This is sometimes called the *Arabi-san.* It was extensively used during the Mahratta supremacy, and is even now sometimes found, though rarely. It is nine years behind the Fasali of the Dakhan, but in other respects is just the same; thus, its year commences when the sun enters the nakshatra Mṛigaśirsha, in which respect it is solar, but the days and months correspond with Hijra reckoning. It only diverged from the Hijra in A.D. 1344, according to the best computation, since when it has been a solar year as described above. On May 15th, A.D. 1344, the Hijra year 745 began. But since then the Shahûr reckoning was carried on by itself as a solar year. To convert it to an A.D. year, add 599.

*The Harsha-Kâla.*—This era was founded by Harshavardhana of Kanauj, [1] or more properly of Thaṇeśar. At the time of Alberuni (A.D. 1030) it was in use in Mathurâ (Muttra) and Kanauj. Its epoch seems to be Śaka 529 current, A.D. 606—7. More than ten inscriptions have been discovered in Nepal [2] dated in the first and second century of this era. In all those discovered as yet the years are qualified only by the word "samvat".

*The Mâgi-San.*—This era is current in the District of Chittagong. It is very similar to the Bengali-san, the days and months in each being exactly alike. The Mâgi is, however, 45 years behind the Bengali year,[3] *e.g.*, Mâgi 1200 = Bengali 1245.

*The Kollam era, or era of Paraśurâma.*—The year of this era is known as the *Kollam âṇḍu. Kollam* (anglicé Quilon) means "western", *âṇḍu* means "a year". The era is in use in Malabar from Mangalore to Cape Comorin, and in the Tinnevelly district. The year is sidereal solar. In North Malabar it begins with the solar month Kanni (Kanyâ), and in South Malabar and Tinnevelly with the month Chiṅgam (Siṁha). In Malabar the names of the months are sign-names, though corrupted from the original Sanskṛit; but in Tinnevelly the names are chiefly those of lunar months, also corrupted from Sanskṛit, such as Śittirai or Chittirai for the Sanskṛit Chaitra, corresponding with Mesha, and so on. The sign-names as well as the lunar-month names are given in the pañchâṅgs of Tinnevelly and the Tamil country. All the names will be found in Table II., Part ii. The first Kollam âṇḍu commenced in Kali 3927 current, Śaka 748 current, A.D. 825—26, the epoch being Śaka 747—48 current, A.D. 824—25. The years of this era as used are current years, and we have treated them so in our Tables.

The era is also called the "era of Paraśurâma", and the years run in cycles of 1000. The present cycle is said to be the fourth, but in actual modern use the number has been allowed to run on over the 1000, A.D. 1894—95 being called Kollam 1070. We believe that there is no record extant of its use earlier than A.D. 825, and we have therefore, in our Table I., left the appropriate column blank for the years A.D. 300—825. If there were really three cycles ending with the year 1000, which expired A.D. 824—25, then it would follow that the Paraśurâma, or Kollam, era began in Kali 1927 current, or the year 3528 of the Julian period. [4]

*The Nevâr era.* This era was in use in Nepal up to A.D. 1768, when the Saka era

1 Alberuni's India, English translation by Sachau, Vol. II., p. 5.

2 *Corpus Inscrip. Indic., Vol. III., Introd., p.* 177 *ff.*

3 Giriśa Chandra's *Chronological Tables for A.D.* 1764 *to* 1900.

4 Warren (*Kâlasankalita, p.* 298) makes it commence in "the year 3537 of the Julian period, answering to the 1926th of the Kali yug". But this is wrong if, as we believe, the Kollam years are current years, and we know no reason to think them otherwise. Warren's account was based on that of Dr. Buchanan who made the 977th year of the third cycle commence in A.D. 1800. But according to the present Malabar use it is quite clear that the year commencing in 1800 A.D., was the 976th Kollam year.

was introduced.[1] Its years are Kârttikâdi, its months amânta, and its epoch (the beginning of the Nevâr year 0 current) is the Kârttikâdi Vikrama year 936 current, Śaka 801—2 current, A.D. 878—79. Dr. F. Kielhorn, in his *Indian Antiquary* paper on the "Epoch of the Newâr era"[2] has come to the conclusion that its years are generally given in expired years, only two out of twenty-five dates examined by him, running from the 235th to the 995th year of the era, being current ones. The era is called the "Nepâl era" in inscriptions, and in Sanskṛit manuscripts; "Nevâr" seems to be a corruption of that word. Table II., Part iii., below gives the correspondence of the years with those of other eras.

*The Châlukya era.* This was a short-lived era that lasted from Saka 998 (A.D. 1076) to Śaka 1084 (A.D. 1162) only. It was instituted by the Châlukya king Vikramâditya Tribhuvana Malla, and seems to have ceased after the defeat of the Eastern Châlukyas in A.D. 1162 by Vijala Kalachuri. It followed the Śaka reckoning of months and pakshas. The epoch was Śaka 998—99 current, A.D. 1075—76.

*The Simha Samvat.*—This era was in use in Kâṭhiâvâḍ and Gujarât. From four dates in that era of the years 32, 93, 96 and 151, discussed in the *Indian Antiquary* (Vols. XVIII. and XIX. and elsewhere), we infer that its year is luni-solar and current; the months are presumably amânta, but in one instance they seem to be pûrṇimânta, and the year is most probably Âshâḍhâdi. It is certainly neither Kârttikâdi nor Chaitrâdi. Its epoch is Śaka 1036—37 current, A.D. 1113—14.

*The Lakshmaṇa Sena era.*—This era is in use in Tirhut and Mithila, but always along with the Vikrama or Śaka year. The people who use it know little or nothing about it. There is a difference of opinion as to its epoch. Colebrooke (A.D. 1796) makes the first year of this era correspond with A.D. 1105; Buchanan (A.D. 1810) fixes it as A.D. 1105 or 1106; Tirhut almanacs, however, for the years between A.D. 1776 and 1880 shew that it corresponds with A.D. 1108 or 1109. Buchanan states that the year commences on the first day after the full moon of the month Âshâḍha, while Dr. Râjendra Lâl Mitra (A.D. 1878) and General Cunningham assert that it begins on the first Mâgha badi (Mâgha kṛishṇa 1st).[3] Dr. F. Kielhorn, examining six independent inscriptions dated in that era (from A.D. 1194 to 1551), concludes[4] that the year of the era is Kârttikâdi; that the months are amânta; that its first year corresponds with A.D. 1119—20, the epoch being A.D. 1118—19, Śaka 1041—42 current; and that documents and inscriptions are generally dated in the expired year. This conclusion is supported by Abul Fazal's statement in the *Akbarnâma* (Śaka 1506, A.D. 1584). Dr. Kielhorn gives, in support of his conclusion, the equation "Laksh: sam: 505 = Śaka sam: 1546" from a manuscript of the *Smṛititattvâmṛita*, and proves the correctness of his epoch by other dates than the six first given.

*The Ilâhi era.*—The "Târîkh-i Ilâhî," that is "the mighty or divine era," was established by the emperor Akbar. It dates from his accession, which, according to the *Tabakât-i-Akbari*, was Friday the 2nd of Rabi-uś-śânî, A.H. 963, or 14th February,[5] 1556 (O. S.), Śaka 1478 current. It was employed extensively, though not exclusively on the coins of Akbar and Jahângir, and appears to have fallen into disuse early in the reign of Shâh-Jahân. According to Abûl Fazal, the days and months are both natural solar, without any intercalations. The names of the months and days correspond with the ancient Persian. The months have from 29 to 30 days each.

[1] General Sir A. Cunningham's *Indian Eras*, p. 74.

[2] *Ind. Ant.*, Vol. XVII., p. 246 ff.

[3] This much information is from General Cunningham's "*Indian Eras*"

[4] *Ind. Ant.*, XIX., p. 1 ff.

[5] General Cunningham, in his "*Indian Eras*", gives it as 15th February; but that day was a Saturday.

There are no weeks, the whole 30 days being distinguished by different names, and in those months which have 32 days the two last are named *roz o shab* (day and night), and to distinguish one from another are called "first" and "second".[1] Here the lengths of the months are said to be "from 29 to 30 days each", but in the old Persian calendar of Yazdajird they had 30 days each, the same as amongst the Parsees of the present day. The names of the twelve months are as follow.—

| | | | | | |
|---|---|---|---|---|---|
| 1 | Farwardîn | 5 | Mirdâd | 9 | Ader |
| 2 | Ardi-behisht | 6 | Shariûr | 10 | Dêi |
| 3 | Khurdâd | 7 | Mihir | 11 | Bahman |
| 4 | Tîr | 8 | Abân | 12 | Isfandarmaz |

*The Mahratta Râja Śaka era.*—This is also called the "Râjyâbhisheka Śaka". The word "Śaka" is used here in the sense of an era. It was established by Śivaji, the founder of the Mahratta kingdom, and commenced on the day of his accession to the throne, *i.e.*, Jyeshṭha śukla trayodaśî (13th) of Śaka 1596 expired, 1597 current, the Ânanda saṁvatsara. The number of the year changes every Jyeshṭha śukla trayodaśî; the years are current; in other respects it is the same as the Southern luni-solar amânta Śaka years. Its epoch is Śaka 1596—97 current, A.D. 1673—74. It is not now in use.

72. *Names of Hindî and N. W. Fasali months.*—Some of the months in the North of India and Bengal are named differently from those in the Peninsula. Names which are manifestly corruptions need not be noticed, though "Bhâdûn" for Bhâdrapada is rather obscure. But "Kuar" for Âśvina, and "Âghân", or "Aghrân", for Mârgaśîrsha deserve notice. The former seems to be a corruption of Kumârî, a synonym of Kanyâ (=Virgo, the damsel), the solar sign-name. If so, it is a peculiar instance of applying a solar sign-name to a lunar month. "Âghân" (or "Aghrân") is a corrupt form of *Âgrahâyaṇa*, which is another name of Mârgaśîrsha.

## PART III.

## DESCRIPTION AND EXPLANATION OF THE TABLES.

73. *Table I.*—Table I. is our principal and general Table, and it forms the basis for all calculations. It will be found divided into three sections, (1) Table of concurrent years; (2) intercalated and suppressed months; (3) moments of commencement of the solar and luni-solar years. All the figures refer to mean solar time at the meridian of Ujjain. The calculations are based on the *Sûrya-Siddhânta*, without the bîja up to 1500 A.D. and with it afterwards, with the exception of cols. 13 to 17 inclusive for which the *Ârya-Siddhânta* has been used. Throughout the table the solar year is taken to commence at the moment of the apparent Mêsha saṅkrânti or first point of Aries, and the luni-solar year with amânta Chaitra śukla pratipadâ. The months are taken as amânta.

74. *Cols. 1 to 5.*—In these columns the *concurrent* years of the six principal eras are

[1] Prinsep's *Indian Antiquities, II., Useful Tables*, p. 171.

given. (As to current and expired years see Art. 70 above.) A short description of eras is given in Art. 71. The years in the first three columns are used alike as solar and luni-solar, commencing respectively with Mesha or Chaitra. (For the beginning point of the year see Art. 52 above.) The Vikrama year given in col. 3 is the Chaitrâdi Vikrama year, or, when treated as a solar year which is very rarely the case, the Meshâdi year. The Âshâḍhâdi and Kârttikâdi Vikrama years are not given, as they can be regularly calculated from the Chaitrâdi year, remembering that the number of the former year is one less than that of the Chaitrâdi year from Chaitra to Jyeshṭha or Âśvina (both inclusive), as the case may be, and the same as the Chaitrâdi year from Âshâḍha or Kârttika to the end of Phâlguna.

*Cols. 4 and 5.* The eras in cols. 4 and 5 are described above (Art. 71.) The double number is entered in col. 4 so that it may not be forgotten that the Kollam year is non-Chaitrâdi or non-Meshâdi, since it commences with either Kanni (Kanyâ) or Chiṅgam (Siṁha). In the case of the Christian era of course the first year entered corresponds to the Kali, Śaka or Chaitrâdi Vikrama year for about three-quarters of the latter's course, and for about the last quarter the second Christian year entered must be taken. The corresponding parts of the years of all these eras as well as of several others will be found in Table II., Parts ii. and iii.

75. *Cols. 6 and 7.*—These columns give the number and name of the current samvatsara of the sixty-year cycle. There is reason to believe that the sixty-year luni-solar cycle (in use mostly in Southern India) came into existence only from about A. D. 909; and that before that the cycle of Jupiter was in use all over India. That is to say, before A. D. 909 the samvatsaras in Southern India were the same as those of the Jupiter cycle in the North. If, however, it is found in any case that in a year previous to A.D. 908 the samvatsara given does not agree with our Tables, the rule in Art. 62 should be applied, in order to ascertain whether it was a luni-solar samvatsara.

The samvatsara given in col. 7 is that which was current at the time of the Mesha saṅkrânti of the year mentioned in cols. 1 to 3. To find the samvatsara current on any particular day of the year the rules given in Art. 59 should be applied. For other facts regarding the samvatsaras, see Arts. 53 to 63 above.

76. *Cols. 8 to 12, and 8a to 12a.* These concern the *adhika* (intercalated) and *kshaya* (suppressed) months. For full particulars see Arts. 45 to 51. By the mean system of intercalations there can be no suppressed months, and by the true system only a few. We have given the suppressed months in italics with the suffix "*Ksh*" for "kshaya." As mean added months were only in use up to A.D. 1100 (*Art. 47*) we have not given them after that year.

77. The name of the month entered in col. 8 or 8*a* is fixed according to the first rule for naming a lunar month (*Art. 46*), which is in use at the present day. Thus, the name *Âshâḍha*, in cols. 8 or 8*a*, shows that there was an intercalated month between natural Jyeshṭha and natural Âshâḍha, and by the first rule its name is "Adhika Âshâḍha", natural Âshâḍha being "Nija Âshâḍha." By the second rule it might have been called Jyeshṭha, but the intercalated period is the same in either case. In the case of expunged months the word "Pausha", for instance, in col. 8 shows that in the lunar month between natural Kârttika and natural Mâgha there were two saṅkrântis; and according to the rule adopted by us that lunar month is called Mârgaśirsha, Pausha being expunged.

78. Lists of intercalary and expunged months are given by the late Prof. K. L. Chhatre in a list published in Vol. I., No. 12 (March 1851) of a Mahrâṭhi monthly magazine called *Jñânaprasâraka*, formerly published in Bombay, but now discontinued; as well as in Cowasjee

Patell's "*Chronology*", and in the late Gen. Sir A. Cunningham's "*Indian Eras*," [1] But in none of these three works is a single word said as to how, or following what authority, the calculations were made, so that we have no guide to aid us in checking the correctness of their results.

79. An added lunar month being one in which no saṅkrânti of the sun occurs, it is evident that a saṅkrânti must fall shortly before the beginning, and another one shortly after the end, of such a month, or in other words, a solar month must begin shortly before and must end shortly after the added lunar month. It is further evident that, since such is the case, calculation made by some other *Siddhânta* may yield a different result, even though the difference in the astronomical data which form the basis of calculation is but slight. Hence we have deemed it essential, not only to make our own calculations afresh throughout, but to publish the actual resulting figures which fix the months to be added and suppressed, so that the reader may judge in each case how far it is likely that the use of a different authority would cause a difference in the months affected. Our columns fix the moment of the saṅkrânti before and the saṅkrânti after the added month, as well as the saṅkrânti after the beginning, and the saṅkrânti before the end, of the suppressed month; or in other words, determine the limits of the adhika and kshaya mâsas. The accuracy of our calculation can be easily tested by the plan shewn in Art. 90 below. (*See also Art. 88 below.*) The moments of time are expressed in two ways, viz., in lunation-parts and tithis, the former following Prof. Jacobi's system as given in *Ind. Ant.*, Vol. XVII.

80. *Lunation-parts* or, as we elsewhere call them, "tithi-indices" (or "*t*") are extensively used throughout this work and require full explanation. Shortly stated a lunation-part is $\frac{1}{10000}$th of an apparent synodic revolution of the moon (*see Note 2, Art. 12 above*). It will be well to put this more clearly. When the difference between the longitude of the sun and moon, or in other words, the eastward distance between them, is *nil*, the sun and moon are said to be in conjunction; and at that moment of time occurs (the end of) *amâvâsyâ*, or new moon. (*Arts. 7, 29 above.*) Since the moon travels faster than the sun, the difference between their longitudes, or their distance from one another, daily increases during one half and decreases during the other half of the month till another conjunction takes place. The time between two conjunctions is a synodic lunar month or a lunation, during which the moon goes through all its phases. The lunation may thus be taken to represent not only time but space. We could of course have expressed parts of a lunation by time-measure, such as by hours and minutes, or ghaṭikâs and palas, or by space-measure, such as degrees, minutes, or seconds, but we prefer to express it in lunation-parts, because then the same number does for either time or space (*see Art. 89 below*). A lunation consists of 30 tithis. $\frac{1}{30}$th of a lunation consequently represents the time-duration of a tithi or the space-measurement of 12 degrees. Our lunation is divided into 10,000 parts, and about 333 lunation-parts ($\frac{1}{10000}$ths) go to one tithi, 667 to two tithis, 1000 to three and so on. Lunation-parts are therefore styled "tithi-indices", and by abbreviation simply "*t*". Further, a lunation or its parts may be taken as apparent or mean. Our tithi-, nakshatra-, and yoga-indices are apparent and not mean, except in the case of mean added months, where the index, like the whole lunation, is mean.

[1] Gen. Cunningham admittedly (p. 91) follows Cowasjee Patell's "*Chronology*" in this respect, and on examination I find that the added and suppressed months in these two works (setting aside some few mistakes of their own) agree throughout with Prof. Chhatre's list, even so far as to include certain instances where the latter was incorrect. Patell's "*Chronology*" was published fifteen years after the publication of Prof. Chhatre's list, and it is not improbable that the former was a copy of the latter. It is odd that not a single word is said in Cowasjee Patell's work to shew how his calculations were made, though in those days he would have required months or even years of intricate calculation before he could arrive at his results. [S. B. D.]

Our tithi-index, or "$t$", therefore shows in the case of true added months as well as elsewhere, the space-difference between the apparent, and in the case of mean intercalations between the mean, longitudes of the sun and moon, or the time required for the motions of the sun and moon to create that difference, expressed in 10,000ths of a unit, which is a circle in the case of space, and a lunation or synodic revolution of the moon in the case of time. Briefly the tithi-index "$t$" shews the position of the moon in her orbit with respect to the sun, or the time necessary for her to gain that position., *e.g.*, "0" is new moon, "5000" full moon, "10,000" or "0" new moon; "50" shews that the moon has recently (*i.e.*, by $\frac{50}{10000}$ths, or 3 hours 33 minutes—*Table X.*, *col.* 3) passed the point or moment of conjunction (new moon); 9950 shews that she is approaching new-moon phase, which will occur in another 3 hours and 33 minutes.

81. A lunation being equal to 30 tithis, the tithi-index, which expresses the 10,000th part of a lunation, can easily be converted into tithi-notation, for the index multiplied by 30 (practically by 3), gives, with the decimal figures marked off, the required figure in tithis and decimals. Thus if the tithi-index is 9950, which is really 0.9950, it is equal to (0.9950 × 30 =) 29.850 tithis, and the meaning is that $\frac{9950}{10000}$ths of the lunation, or 29.850 tithis have expired. Conversely a figure given in tithis and decimals divided by 30 expresses the same in 10,000ths parts of a lunation.

82. The tithi-index or tithi is often required to be converted into a measure of solar time, such as hours or ghaṭikâs. Now the length of an apparent lunation, or of an apparent tithi, perpetually varies, indeed it is varying at every moment, and consequently it is practically impossible to ascertain it except by elaborate and special calculations, but the length of a mean lunation, or of a mean tithi, remains permanently unchanged. Ignoring, therefore, the difference between apparent and mean lunations, the tithi-index or tithi can be readily converted into time by our Table X., which shews the time-value of the mean lunation-part ($\frac{1}{10000}$th of the mean lunation), and of the mean tithi-part ($\frac{1}{1000}$th of the mean tithi). Thus, if $t$ = 50, Table X. gives the duration as 3 hours 33 minutes; and if the tithi-part[1] is given as 0.150 we have by Table X. (2 h. 22 m. + 1 h. 11 min. =) 3 h. 33 m.

It must be understood of course that the time thus given is not very accurate, because the tithi-index ($t$) is an apparent index, while the values in Table X. are for the mean index. The same remark applies to the nakshatra ($n$) or yoga ($y$) indices, and if accuracy is desired the process of calculation must be somewhat lengthened. This is fully explained in example 1 in Art. 148 below. In the case of mean added months the value of ($t$) the tithi-index is at once absolutely accurate.

83. The saṅkrântis preceding and succeeding an added month, as given in our Table I., of course take place respectively in the lunar month preceding and succeeding that *added* month.

84. To make the general remarks in Arts. 80, 81, 82 quite clear for the intercalation of months we will take an actual example. Thus, for the Kali year 3403 the entries in cols. 9 and 11 are 9950 and 287, against the true added month Âśvina in col. 8. This shews us that the saṅkrânti preceding the true added, or Adhika, Âśvina took place when 9950 lunation-parts of the natural month Bhâdrapada (preceding Adhika Âśvina) had elapsed, or when (10,000 - 9950 =) 50 parts had to elapse before the end of Bhâdrapada, or again when 50 parts had to elapse

[1] A thousandth part of a tithi is equal to 1.42 minutes, which is sufficiently minute for our purposes, but a thousandth of a lunation is equivalent to 7 hours 5 minutes, and this is too large, so that we have to take the 10,000th of a lunation as our unit, which is equal to 4.25 minutes, and this suffices for all practical purposes. In this work therefore a lunation is treated of as having 10,000 parts, and a tithi 1000 parts.

before the beginning of the added month; and that the saṅkrânti succeeding true Adhika Âśvina took place when 287 parts of the natural month Nija Âśvina had elapsed, or when 287 parts had elapsed after the end of the added month Adhika Âśvina.

85. The moments of the saṅkrântis are further given in tithis and decimals in cols. 10, 12, 10*a* and 12*a*. Thus, in the above example we find that the preceding saṅkrânti took place when 29·850 tithis of the preceding month Bhâdrapada had elapsed, *i.e.*, when (30—29·850 =) 0·150 tithis had still to elapse before the end of Bhâdrapada; and that the succeeding saṅkrânti took place when 0·861 of a tithi of the succeeding month, Âśvina, had passed.

To turn these figures into time is rendered easy by Table X. We learn from it that the preceding saṅkrânti took place (50 lunation parts or 0·150 tithi parts) about 3 h. 33 m. before the beginning of Adhika Âśvina; and that the succeeding saṅkrânti took place (287 lunation parts, or ·861 tithi parts) about 20 h. 20 m. after the end of Adhika Âśvina. This time is approximate. For exact time see Arts. 82 and 90.

The tithi-indices here shew (*see Art. 88*) that there is no probability of a different month being intercalated if the calculation be made according to a different authority.

86. To constitute an expunged month we have shewn that two saṅkrântis must occur in one lunar month, one shortly after the beginning and the other shortly before the end of the month; and in cols. 9 and 10 the moment of the first saṅkrânti, and in cols. 11 and 12 that of the second saṅkrânti, is given. For example see the entries against Kali 3506 in Table I. As already stated, there can never be an expunged month by the mean system

87. In the case of an added month the moon must be waning at the time of the preceding, and waxing at the time of the succeeding saṅkrânti, and therefore the figure of the tithi-index must be approaching 10,000 at the preceding, and over 10,000, or beginning a new term of 10,000, at the succeeding, saṅkrânti. In the case of expunged months the case is reversed, and the moon must be waxing at the first, and waning at the second saṅkrânti; and therefore the tithi-index must be near the beginning of a period of 10,000 at the first, and approaching 10,000 at the second, saṅkrânti.

88. When by the *Sûrya-Siddhânta* a new moon (the end of the amâvâsyâ) takes place within about 6 ghaṭikâs, or 33 lunation-parts, of the saṅkrânti, or beginning and end of a solar month, there may be a difference in the added or suppressed month if the calculation be made according to another *Siddhânta*. Hence when, in the case of an added month, the figure in col. 9 or 9*a* is more than (10,000—33 =) 9967, or when that in col. 11 or 11*a* is less than 33; and in the case of an expunged month when the figure in col. 9 is less than 33, or when that in col. 11 is more than 9967, it is possible that calculation by another *Siddhânta* will yield a different month as intercalated or expunged; or possibly there will be no expunction of a month at all. In such cases fresh calculations should be made by Prof. Jacobi's Special Tables (*Epig. Ind., Vol. II.*) or direct from the *Siddhânta* in question. In all other cases it may be regarded as certain that our months are correct for all *Siddhântas*. The limit of 33 lunation-parts here given is generally sufficient, but it must not be forgotten that where *Siddhântas* are used with a bîja correction the difference may amount to as much as 20 ghaṭikâs, or 113 lunation-parts *(See above, note to Art. 49)*.

In the case of the *Sûrya-Siddhânta* it may be noted that the added and suppressed months are the same in almost all cases, whether the bîja is applied or not.

89. We have spared no pains to secure accuracy in the calculation of the figures entered in cols. 9 to 12 and 9*a* to 12*a*, and we believe that they may be accepted as finally correct,

but it should be remembered that their time-equivalent as obtained from Table X. is only approximate for the reason given above (*Art. 82.*) Since Indian readers are more familiar with tithis than with lunation-parts, and since the expression of time in tithis may be considered desirable by some European workers, we have given the times of all the required sankrântis in tithis and decimals in our columns, as well as in lunation-parts; but for turning our figures into time-figures it is easier to work with lunation-parts than with tithi parts. It may be thought by some readers that instead of recording the phenomena in lunation-parts and tithis it would have been better to have given at once the solar time corresponding to the moments of the sankrântis in hours and minutes. But there are several reasons which induced us, after careful consideration, to select the plan we have finally adopted. First, great labour is saved in calculation; for to fix the exact moments in solar time at least five processes must be gone through in each case, as shewn in our Example I. below (*Art. 148*) It is true that, by the single process used by us, the time-equivalents of the given lunation-parts are only approximate, but the lunation-parts and tithis are in themselves exact. Secondly, the time shewn by our figures in the case of the mean added months is the same by the Original *Sûrya*, the Present *Sûrya*, and the *Ârya-Siddhânta*, as well as by the Present *Sûrya-Siddhânta* with the bîja, whereas, if converted into solar time, all of these would vary and require separate columns. Thirdly, the notation used by us serves one important purpose. It shews in one simple figure the distance in time of the sankrântis from the beginning and end of the added or suppressed month, and points at a glance to the probability or otherwise of there being a difference in the added or suppressed month in the case of the use of another authority. Fourthly, there is a special convenience in our method for working out such problems as are noticed in the following articles.

90. Supposing it is desired to prove the correctness of our added and suppressed months, or to work them out independently, this can easily be done by the following method: The moment of the Mesha saṅkrânti according to the *Sûrya-Siddhânta* is given in cols. 13, 14 and 15*a* to 17*a* for all years from A.D. 1100 to 1900, and for other years it can be calculated by the aid of Table D. in *Art. 96* below. Now we wish to ascertain the moment of two consecutive new moons connected with the month in question, and we proceed thus. The interval of time between the beginning of the solar year and the beginning or end of any solar month according to the *Sûrya-Siddhânta*, is given in Table III., cols. 8 or 9; and by it we can obtain by the rules in Art. 151 below, the tithi-index for the moment of beginning and end of the required solar month, *i.e.*, the moments of the solar saṅkrântis, whose position with reference to the new moon determines the addition or suppression of the luni-solar month. The exact interval also in solar time between those respective saṅkrântis and the new moons (remembering that at new moon "*t*" = 10,000) can be calculated by the same rules. This process will at once shew whether the moon was waning or waxing at the preceding and succeeding sankrântis, and this of course determines the addition or suppression of the month. The above, however, applies only to the apparent or true intercalations and suppressions. For mean added months the *Sodhya* (2 d. 8 gh. 51 p. 15 vi.) must be added (*see Art. 26*) to the Mesha-saṅkrânti time according to the *Ârya-Siddhânta* (*Table I.*, col. 15), and the result will be the time of the mean Mesha sankrânti. For the required subsequent saṅkrântis all that is necessary is to add the proper figures of duration as given in Art. 24, which shews the mean length of solar months, and to find the "*a*" for the results so obtained by Art. 151. Then add 200 to the totals and the result will be the required tithi-indices.

91. It will of course be asked how our figures in Table I. were obtained, and what guarantee we can give for their accuracy. It is therefore desirable to explain these points. Our calcula-

tions for true intercalated and suppressed months were first made according to the method and Tables published by Prof. Jacobi (*in the Ind. Ant., Vol. XVII., pp. 145 to 181*) as corrected by the errata list printed in the same volume. We based our calculations on his Tables 1 to 10, and the method given in his example 4 on pp. 152—53,[1] but with certain differences, the necessity of which must now be explained. Prof. Jacobi's Tables 1 to 4, which give the dates of the commencement of the solar months, and the hour and minute, were based on the *Ârya-Siddhânta*, while Tables 5 to 10 followed the *Sûrya-Siddhânta*, and these two *Siddhântas* differ. In consequence several points had to be attended to. First, in Prof. Jacobi's Tables 1 to 4 the solar months are supposed to begin exactly at Ujjain mean sunset, while in fact they begin (as explained by himself at p. 147) at *or shortly after* mean sunset. This state of things is harmless as regards calculations made for the purpose for which the Professor designed and chiefly uses these Tables, but such is not the case when the task is to determine an intercalary month, where a mere fraction may make all the difference, and where the exact moment of a saṅkrânti must positively be ascertained. Secondly, the beginning of the solar year, *i.e.*, the moment of the Mesha-saṅkranti, differs when calculated according to those two *Siddhântas*, as will be seen by comparing cols. 15 to 17 with cols. 15*a* to 17*a* of our Table I., the difference being *nil* in A.D. 496 and 6 gh. 23 pa. 41.4 pra. vi. in 1900 A.D. Thirdly, even if we suppose the year to begin simultaneously by both *Siddhântas*, still the collective duration of the months from the beginning of the year to the end of the required solar month is not the same,[2] as will be seen by comparing cols. 6 or 7 with cols. 8 or 9 of our Table III. We have applied all the corrections necessitated by these three differences to the figures obtained from Prof. Jacobi's Tables and have given the final results in cols. 9 and 11. We know of no independent test which can be applied to determine the accuracy of the results of our calculations for true added and suppressed months; but the first calculations were made exceedingly carefully and were checked and rechecked. They were made quite independently of any previously existing lists of added and suppressed months, and the results were afterwards compared with Prof. Chhatre's list; and whenever a difference appeared the calculations were completely re-examined. In some cases of expunged months the difference between the two lists is only nominal, but in other cases of difference it can be said with certainty that Prof. Chhatre's list is wrong. (*See note to Art. 46.*) Moreover, since the greatest possible error in the value of the tithi-index that can result by use of Prof. Jacobi's Table is 7 (*see his Table p. 164*), whenever the tithi-index for added and suppressed months obtained by our computation fell within 7 of 10,000, *i.e.*, whenever the resulting index was below 7 or over 9993, the results were again tested direct by the *Sûrya-Siddhânta*.[3]

As regards mean intercalations every figure in our cols. 9*a* to 12*a* was found correct by independent test. The months and the times of the saṅkrântis expressed in tithi-indices and tithis were calculated by the present *Sûrya-Siddhânta*, and the results are the same whether

1 For finding the initial date of the luni-solar years Prof. Jacobi's Tables I. to XI. were used, and in the course of the calculations it was necessary to introduce a few alterations, and to correct some misprints which had crept in in addition to those noted in the already published errata-list. Thus, the earliest date noted in Tables I. to IV., being A.D. 564, these Tables had to be extended backwards by adding two lines more of figures above those already given. In Table VI., as corrected by the errata, the bîja is taken into account only from A.D. 1601, whereas we consider that it should be introduced from A.D. 1501 (*see Art. 21*). In Table VI. the century correction is given for the New (Gregorian) Style from A.D. 1600 according to the practice in the most part of Europe. I have preferred, however, to introduce the New Style into our Tables from Sept. A.D. 1752 to suit English readers, and this necessitated an alteration in the century data for two centuries. [R. S.]

2 It is the same according to Warren, but in this respect he is in error. (*See note to Art. 24.*)

3 42 calculations were thus made direct by the *Sûrya-Siddhânta* with and without the bîja, with the satisfactory result that the error in the final figure of the tithi-index originally arrived at was generally only of 1 or 2 units, while in some cases it was *nil*. It was rarely 3, and only once 4. It never exceeded 4. It may therefore be fairly assumed that our results are accurate. [S. B. D.]

worked by that or by the Original *Sûrya-Siddhânta*, the First *Ârya-Siddhânta*, or the Present *Sûrya-Siddhânta* with the bîja.

We think, therefore, that the list of true added and suppressed months and that of the mean added months as given by us is finally reliable.

92. *Cols. 13 to 17 or to 17a.* The solar year begins from the moment of the Mesha sankrânti and this is taken as *apparent and not mean.* We give the exact moment for all years from A.D. 300 to 1900 by the *Ârya-Siddhânta*, and in addition for years between A.D 1100 and 1900 by the *Sûrya-Siddhântas* as well. (*See also Art. 96*). Every figure has been independently tested, and found correct. The week-day and day of the month A.D. as given in cols. 13 and 14 are applicable to both the *Siddhântas*, but particular attention must be paid to the footnote in Table I., annexed to A.D. 1117—18 and some other subsequent years. The entries in cols. 15 and 15*a* for Indian reckoning in ghatikâs and palas, and in cols. 17 and 17*a* for hours and minutes, imply that at the instant of the sankrânti so much time has elapsed since mean sunrise at Ujjain on the day in question. Ujjain mean sunrise is generally assumed to be 6.0 a.m.

93. The alteration of week-day and day of the month alluded to in the footnote mentioned in the last paragraph (Table I., A.D. 1117—18) is due to the difference resulting from calculations made by the two *Siddhântas*, the day fixed by the *Sûrya-Siddhânta* being sometimes one later than that found by the *Ârya-Siddhânta*. It must be remembered, however, that the day in question runs from sunrise to sunrise, and therefore a moment of time fixed as falling between midnight and sunrise belongs to the preceding day in Indian reckoning, though to the succeeding day by European nomenclature. For example, the Mesha sankrânti in Saka 1039 expired (A.D. 1117) took place, according to the *Ârya-Siddhânta* on Friday 23rd March at 58 gh. 1p. after Ujjain mean sunrise (23 h. 12 m. after sunrise on Friday, or 5.12 a.m. on Saturday morning, 24th); while by the *Sûrya-Siddhânta* it fell on Saturday 24th at 0 gh. 51 pa. (=0 h. 20 m. after sunrise or 6.20 a.m.). This only happens of course when the sankrânti according to the *Ârya-Siddhânta* falls nearly at the end of a day, or near mean sunrise.

94. In calculating the instant of the apparent Mesha-sankrântis, we have taken the sodhya at 2 d. 8 gh. 51 pa. 15 vipa. according to the *Ârya-Siddhânta*, and 2 d. 10 gh. 14 pa. 30 vipa. according to the *Sûrya-Siddhânta*. (*See Art. 26.*)

95. The figure given in brackets after the day and month in cols. 13 and 19 is the number of that day in the English common year, reckoning from January 1st. For instance, 75 against 16th March shows that 16th March is the 75th day from January 1st inclusive. This figure is called the "date indicator", or shortly (*d*), in the methods of computation "B" and "C" given below (*Part IV.*), and is intended as a guide with reference to Table IX., in which the collective duration of days is given in the English common year.

96. The fixture of the moments of the 1600 Mesha-sankrântis noted in this volume will be found advantageous for many purposes, but we have designed it chiefly to facilitate the conversion of solar dates as they are used in Bengal and Southern India.[1] We have not given the moments of Mesha-sankrântis according to the *Sûrya-Siddhânta* prior to A.D. 1100, so that the *Ârya-Siddhânta* computation must be used for dates earlier than that, even those occurring in Bengal. There is little danger in so doing, since the difference between the times of the Mesha-sankrântis according to the two *Siddhântas* during that period is very slight, being *nil* in A.D. 496, and only increasing to 1 h. 6 m. at the most in 1100 A.D. It is, however, advisable to give a correction Table so as to ensure accuracy, and consequently we append the Table which follows, by which the difference for any year lying between A.D. 496 and 1100 A.D. can be found. It is

[1] See Art. 21, and the first footnote appended to it.

used in the following manner. First find the interval in years between the given year and A.D. 496. Then take the difference given for that number of years in the Table, and subtract or add it to the moment of the Mesha-saṅkrânti fixed by us in Table I. by the *Ârya-Siddhânta*, according as the given year is prior or subsequent to A.D. 496. The quotient gives the moment of the Mesha-saṅkrânti by the *Sûrya-Siddhânta.*

**TABLE**

**Shewing the difference between the moments of the Mesha-saṅkrânti as calculated by the Present Sûrya and the first Arya-Siddhântas; the difference in A.D. 496 (Saka 496 current) being 0.**

| No. of years | Difference Expressed in | | | No. of years | Difference Expressed in | | | No. of years | Difference Expressed in | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | gh. | pa. | minutes. | | gh. | pa. | minutes. | | gh. | pa. | minutes. |
| 1 | 0 | 0.3 | 0.1 | 10 | 0 | 2.7 | 1.1 | 100 | 0 | 27.3 | 10.9 |
| 2 | 0 | 0.5 | 0.2 | 20 | 0 | 5.5 | 2.2 | 200 | 0 | 54.6 | 21.9 |
| 3 | 0 | 0.8 | 0.3 | 30 | 0 | 8.2 | 3.3 | 300 | 1 | 22.0 | 32.8 |
| 4 | 0 | 1.1 | 0.4 | 40 | 0 | 10.9 | 4.4 | 400 | 1 | 49.3 | 43.7 |
| 5 | 0 | 1.4 | 0.5 | 50 | 0 | 13.7 | 5.5 | 500 | 2 | 16.6 | 54.7 |
| 6 | 0 | 1.6 | 0.7 | 60 | 0 | 16.4 | 6.6 | 600 | 2 | 44.0 | 65.6 |
| 7 | 0 | 1.9 | 0.8 | 70 | 0 | 19.1 | 7.7 | 700 | 3 | 11.3 | 76.5 |
| 8 | 0 | 2.2 | 0.9 | 80 | 0 | 21.9 | 8.7 | 800 | 3 | 38.6 | 87.5 |
| 9 | 0 | 2.5 | 1.0 | 90 | 0 | 24.6 | 9.8 | 900 | 4 | 6.0 | 98.4 |

*Example.* Find the time of the Mesha saṅkrânti by the *Sûrya-Siddhânta* in A.D. 1000. The difference for (1000 − 496 =) 504 years is (2 gh. 16.6 pa. + 1.1 pa. =) 2 gh. 17.7 pa. Adding this to Friday, 22nd March, 42gh. 5pa., *i.e.*, the time fixed by the *Ârya-Siddhânta* (*Table I., cols. 14, 15*), we have 44 gh. 22.7 pa. from sunrise on that Friday as the actual time by the *Sûrya-Siddhânta.*

97. *Cols. 19 to 25.* The entries in these columns enable us to convert and verify Indian luni-solar dates. They were first calculated, as already stated, according to the Tables published by Prof. Jacobi in the *Indian Antiquary*[1] (Vol. XVII.). The calculations were not only most carefully made, but every figure was found to be correct by independent test. As now finally issued, however, the figures are those obtained from calculations direct from the *Sûrya-Siddhânta*, specially made by Mr. S. Bâlkrishna Dîkshit. The articles *a, b, c*, in cols. 23 to 25 are very important as they form the basis for all calculations of dates demanding an exact result. Their meaning is fully described below (*Art. 102.*).

The meaning of the phrase "moon's age" (*heading of cols. 21, 22*) in the Nautical Almanack is the mean time in *days* elapsed since the moon's conjunction with the sun (*amâvâsyâ*, new moon). For our purposes the moon's age is its age in lunation-parts and tithis, and these have been fully explained above.

98. The week-day and day of the month A.D. given in cols. 19 and 20 shew the civil day on which Chaitra sukla pratipadâ of each year, as an apparent tithi, ends.[2] The figures given in cols. 21 to 25 relate to Ujjain mean sunrise on that day.

1 *See note 1 to Art.* 91

2 We have seen before (*Arts. 45 etc. above*) how months and tithis are sometimes added or expunged. Now in case of Chaitra sukla pratipadâ being current at sunrise on two successive days, as sometimes happens, the first of these civil days, *i.e.*, the day previous to that given by us, is taken as the first day of the Indian luni-solar year (*see Art. 52*). This does not, however, create any confusion in our method C since the quantities given in cols. 23 to 25 are correct for the day and time for which they are given, while as for our methods A and B, the day noted by us is more convenient.

99. When an intercalary Chaitra occurs by the true system *(Arts. 45 etc. above)* it must be remembered that the entries in cols. 19 to 25 are for the śukla-pratipadâ of the *intercalated*, not the *true*, Chaitra.

100. The first tithi of the year (Chaitra śukla pratipadâ) in Table I., cols. 19 to 25, is taken as an apparent, not mean, tithi, which practice conforms to that of the ordinary native panchângs. By this system, as worked out according to our methods A and B, the English equivalents of all subsequent tithis will be found as often correct as if the first had been taken as a mean tithi;—probably more often.

101. The figures given in cols. 21 and 22, except in those cases where a minus sign is found prefixed (*e.g.*, Kali 4074 current), constitute a first approximation showing how much of chaitra sukla pratipadâ had expired on the occurrence of mean sunrise at Ujjain on the day given in cols. 19 and 20. Col. 21 gives the expired lunation-parts or tithi-index, and col. 22 shews the same period in tithi-parts, *i.e.*, decimals of a tithi. The meaning of both of these is explained above (*Arts. 80 and 81*). We differ from the ordinary pañchângs in one respect, viz., that while they give the portion of the tithi which has to run after mean sunrise, we have given, as in some ways more convenient, the portion already elapsed at sunrise. Thus, the entry 286 in col. 21 means that 286 lunation-parts of Chaitra śukla 1st had expired at mean sunrise. The new moon therefore took place 286 lunation-parts before mean sunrise, and by Table X., col. 3. 286 lunation-parts are equal to (14 h. 10 m. + 6 h. 6 m. =) 20 h. 16 m. The new moon therefore took place 20 h. 16 m. before sunrise, or at 9.44 a.m. on the previous day by European reckoning. The ending-moment of Chaitra sukla pratipadâ can be calculated in the same way, remembering that there are 333 lunation-parts to a tithi.

We allude in the last paragraph to those entries in cols. 21 and 22 which stand with a minus sign prefixed. Their meaning is as follows:—Just as other tithis have sometimes to be expunged so it occasionally happens that Chaitra śukla 1st has to be expunged. In other words, the last tithi of Phâlguna, or the tithi called amâvâsyâ, is current at sunrise on one civil day and the 2nd tithi of Chaitra (Chaitra sukla dvitiyâ) at sunrise on the following civil day. In such a case the first of these is the civil day corresponding to Chaitra śukla 1st; and accordingly we give this civil day in cols. 19 and 20. But since the amâvâsyâ-tithi (the last tithi of Phâlguna) was actually current at sunrise on that civil day we give in cols. 21 and 22 the lunation-parts and tithi-parts of the amâvâsyâ-tithi which have to run after sunrise with a minus sign prefixed to them. Thus, "—12" in col. 21 means that the tithi-index at sunrise was 10,000—12 = or 9988, and that the amâvâsyâ-tithi (Phâlguna Krishṇa 15 or 30) *(Table VIII., col. 3)* will end 12 lunation-parts after sunrise, while the next tithi will end 333 lunation-parts after that.

102. *(a, b, c, cols. 23, 24, 25)*. The moment of any new moon, or that moment in each lunation when the sun and moon are nearest together, in other words when the longitudes of the sun and moon are equal, cannot be ascertained without fixing the following three elements,—(*a*) The eastward distance of the moon from the sun in mean longitude, (*b*) the moon's mean anomaly (*Art. 15 and note*), which is here taken to be her distance from her perigee in mean longitude, (*c*) the sun's mean anomaly, or his distance from his perigee in mean longitude. And thus our "*a*", "*b*", "*c*", have the above meanings; "*a*" being expressed in 10,000ths of a circle reduced by 200.6 for purposes of convenience of use, all calculations being then additive, "*b*" and "*c*" being given in 1000ths of the circle. To take an example. At Ujjain mean sunrise on Chaitra śukla pratipadâ of the Kali year 3402 (Friday, 8th March, A.D. 300), the mean longitudes calculated direct from the *Sûrya-Siddhânta* were as follow: The sun, 349° 22′ 27″.92.

The sun's perigee, 257° 14′ 22″.86. The moon, 355° 55′ 35″.32. The moon's perigee, 33° 39′ 58″ 03. The moon's distance from the sun therefore was (355° 55′ 35″.32—349° 22′ 27″.92 =) 6° 33′ 7″.4 = .0182 of the orbit of 360°. This (1.0182) reduced by 0.0200,6 comes to 0.99814; and consequently "*a*" for that moment is 9981·41. The moon's mean anomaly "*b*" was (355° 55′ 35″.32—33° 39′ 58″.03 =) 322° 15′ 37″.29 = 895·17. And the sun's mean anomaly "*c*" was (349° 22′ 27″.92—257° 14′ 22″.86 =) 92° 8′ 5″.06 = 255·93.[1] We therefore give $a = 9981$, $b = 895$, $c = 256$. The figures for any other year can if necessary be calculated from the following Table, which represents the motion. The increase in *a*, *b*, *c*, for the several lengths of the luni-solar year and for 1 day, is given under their respective heads; the figures in brackets in the first column representing the day of the week, and the first figures the number of days in the year.

**Increase of a, b, c, in one year, and in one day.**

| *Number of days in the year.* | *a.* | *b.* *without bîja* | *b.* *with bîja.* | *c.* |
|---|---|---|---|---|
| 354(4) | 9875.703487 | 847.2197487 | 847.220646 | 969.1758567 |
| 355(5) | 214.335267 | 883.5113299 | 883.512230 | 971.9139416 |
| 383(5) | 9696.029303 | 899.675604 | 899.676575 | 48.57161909 |
| 384(6) | 34.661235 | 935.967185 | 935.968158 | 51.3094039 |
| 385(0) | 373.293168 | 972.258766 | 972.259742 | 54.04759 |
| 1(1) | 338.63193033 | 36.291581211 | 36.291598746 | 2.737784906 |

103. *Table II.*, Part i., of this table will speak for itself (*see also Art. 51 above*). In the second part is given, in the first five columns, the correspondence of a cycle of twelve lunar months of a number of different eras with the twelve lunar months of the Śaka year 1000,[2] which itself corresponds exactly with Kali 4179, Chaitrâdi Vikrama 1135, and Gupta 758. Cols. 8 to 13 give a similar concurrence of months of the solar year Śaka 1000. The concurrence of parts of solar months and of parts of the European months with the luni-solar months is given in cols. 6 and 7, and of the same parts with the solar months in cols. 14 and 15. Thus, the luni-solar amânta month Âshâḍha of the Chaitrâdi Saka year 1000 corresponds with amânta Âshâḍha of Kali 4179, of Chaitrâdi Vikrama 1135, and of the Gupta era 758; of the Âshâḍhâdi Vikrama year 1135, and of the Chedi or Kalachuri 828; of the Kârttikâdi Vikrama year 1134, and of the Nêvâr year 198. Parts of the solar months Mithuna and Karka, and parts of June and July of 1077 A.D. correspond with it; in some years parts of the other

[1] Calculating by Prof. Jacobi's Tables, *a*, *b*, *c*, are 9980, 896 and 255, each of which is wrong by 1.

The above figures were submitted by me to Dr. Downing of the Nautical Almanack office, with a request that he would test the results by scientific European methods. In reply he gave me the following quantities, for the sun from Leverrier's Tables and and for the moon from Hansen's Tables (for the epoch A.D. 1000, March 8th, 6 a.m., for the meridian of Ujjain). Mean long. of sun 345° 51′ 47″·7, Do. of sun's perigee 253° 54′ 58″·5. Do. of moon 353° 0′ 36″·0, Do. of moon's perigee 36° 0′ 45″·4. He also verified the statement that the sunrise on the morning of March 8th was that immediately following new moon. The difference in result is partly caused by the fact that Leverrier's and Hansen's longitudes are tropical, and those of the *Sûrya-Siddhânta* sidereal. Comparing the two results we find a difference of 0° 35′ 40″·9 in "*a*", 5° 24′ 49″·69 in "*b*", 0° 13′ 18″·87 in "*c*". The closeness of the results obtained from the use of (1) purely Hindu (2) purely European methods is remarkable. Our Tables being for Indian documents and inscriptions we of course work by the former. [R. S.]

[2] This year Saka 1000 is chosen for convenience of addition or subtraction when calculating other years, and therefore we have not taken into account the fact that Ś 1000 was really an intercalary year, having both an Adhika Jyeshṭha and a Nija Jyeshṭha month. That peculiarity affects only that one year and not the concurrence of other months of previous or subsequent years in other eras.

two Christian months noted in col. 7 will correspond with it. In the year Śaka 1000, taken as a Meshâdi solar year, the month Siṁha corresponds with the Bengali Bhâdrapada and the Tamil Âvaṇi of the Meshâdi Kali 4179, and Meshâdi Vikrama 1135; with Âvaṇi of the Siṁhâdi Tinnevelly year 253; with Chingam of the South Malayâḷam Siṁhâdi Kollam âṇḍu 253, and of the North Malayâḷam Kanyâdi Kollam âṇḍu 252. Parts of the lunar months Śrâvaṇa and Bhâdrapada correspond with it, as well as parts of July and August of the European year 1077 A.D; in some years parts of August and September will correspond with it.

All the years in this Table are current years, and all the lunar months are amânta.

It will be noticed that the Tuḷu names of lunar months and the Tamil and Tinnevelly names of solar months are corruptions of the original Sanskrit names of lunar months; while the north and south Malayâḷam names of solar months are corruptions of the original Sanskṛit sign-names. Corruptions differing from these are likely to be found in use in many parts of India. In the Tamil Districts and the district of Tinnevelly the solar sign-names are also in use in some places.

104. *Table II.*, Part iii. This portion of the Table, when read with the notes printed below would seem to be simple and easy to be understood, but to make it still clearer we give the following rules:—

I. Rule for turning into a Chaitrâdi or Meshâdi year (for example, into a luni-solar Śaka, or solar Śaka, year) a year of another era, whether earlier or later, which is non-Chaitrâdi or non-Meshâdi.

(*a*) *For an earlier era.* When the given date falls between the first moment of Chaitra or Mesha and the first moment of the month in which, as shewn by the heading, the year of the given earlier era begins, subtract from the given year the first, otherwise the second, of the double figures given under the heading of the earlier era along the line of the year 0 of the required Chaitrâdi or Meshâdi era (*e.g.*, the Śaka).

*Examples.* (1) To turn Vaiśâkha Śukla 1st of the Âshâḍhâdi Vikrama year 1837, or Śrâvaṇa sukla 1st of the Kârttikâdi Vikrama year 1837 into corresponding Śaka reckoning. The year is (1837—134 =) 1703 Śaka. The day and month are the same in each case. (2) To turn Mâgha śukla 1st of the Kârttikâdi Vikrama samvat 1838 into the corresponding Śaka date. The year is (1838—135 =) 1703 Śaka. The day and month are the same. (3) Given 1st December, 1822 A.D. The year is (1822—77 =) 1745 Śaka current. (4) Given 2nd January, 1823 A.D. The year is (1823—78 =) 1745 Śaka current.

(*b*) *For a later era.* When the given day falls between the first moment of Chaitra or Mesha and the first moment of the month in which, as shewn by the heading, the later era begins, add to the number of the given year the figure in the Table under the heading of the required Chaitrâdi or Meshâdi era along the line of the year 0, 1 of the given later era. In the reverse case add that number reduced by one.

*Examples.* (1) To turn the 1st day of Mithuna 1061 of the South Malayâḷam Kollam Âṇḍu into the corresponding Śaka date. The year is (1061 + 748 =) Śaka 1809 current. The day and month are the same. (2) To turn the 1st day of Makara 1062 of the South Malayâḷam Kollum Âṇḍu into the corresponding Śaka date. The year is (1062 + 747 =) 1809 Śaka current. The day and month are the same.

II. Rule for turning a Chaitrâdi or Meshâdi (*e.g.*, a Śaka) year into a non-Chaitrâdi or non-Meshâdi year of an earlier or later era.

(*a*) *For an earlier era.* When the given day falls between the first moment of Chaitra or Mesha and the first moment of the month in which, as shown by the heading, the year of the

earlier era begins, add to the given Chaitrâdi or Meshâdi year the first, otherwise the second, of the double figures given under the heading of the earlier era along the line of the year 0 of the Chaitrâdi or Meshâdi era given.

*Examples.* (1) To turn Bhâdrapada krishṇa 30th of the Śaka year 1699 into the corresponding Kârttikâdi Vikrama year. The year is (1699 + 134 =) 1833 of the Kârttikâdi Vikrama era. The day and month are the same. (2) To turn the same Bhâdrapada krishṇa 30th, Śaka 1699, into the corresponding Âshâḍhâdi Vikrama year. The year is (1699 + 135 =) 1834 of the Âshâḍhâdi Vikrama era. The day and month are the same.

(*b*) *For a later era.* When the given day falls between the first moment of Chaitra or Mesha and the first moment of the month in which, as shown by the heading, the later era begins, subtract from the given year the number under the heading of the given Chaitrâdi or Meshâdi era along the line of the year 0/1 of the given later era; in the reverse case subtract that number reduced by one.

*Examples.* (1) To turn the 20th day of Siṁha Śaka 1727 current into the corresponding North Malayâlam Kollam Âṇḍu date. The day and month are the same. The era is a Kanyâdi era, and therefore the required year is (1727—748 =) 979 of the required era. (2) To turn the 20th day of Siṁha Śaka 1727 current into the corresponding South Malayâḷam (Tinnevelly) Kollam Âṇḍu date. The day and month are the same. The era is Siṁhâdi, and therefore the required year is (1727—747 =) 980 of the required era.

III. Rule for turning a year of one Chaitrâdi or Meshâdi era into one of another Chaitrâdi or Meshâdi era. This is obviously so simple that no explanations or examples are required.

IV. Rule for turning a year of a non-Chaitrâdi or non-Meshâdi era into one of another year equally non-Chaitrâdi or non-Meshâdi These are not required for our methods, but if any reader is curious he can easily do it for himself.

This Table must be used for all our three methods of conversion of dates.

105. *Table III.*—The numbers given in columns 3*a* and 10 are intended for use when calculation is made approximately by means of our method "*B*" (*Arts. 137, 138*).

It will be observed that the number of days in lunar months given in col. 3*a* is alternately 30 and 29; but such is not always the case in actual fact. In all the twelve months it occurs that the number of days is sometimes 29 and sometimes 30. Thus Bhâdrapada has by our Table 29 days, whereas it will be seen from the pañchâṅg extract printed in Art. 30 above that in A.D. 1894 (Śaka 1816 expired) it had 30 days.

The numbers given in col. 10 also are only approximate, as will be seen by comparing them with those given in cols. 6 to 9.

Thus all calculations made by use of cols. 3*a* and 10 will be sometimes wrong by a day. This is unavoidable, since the condition of things changes every year, so that no single Table can be positively accurate in this respect; but, other elements of the date being certain, calculations so made will *only* be wrong by one day, and if the week-day is given in the document or inscription concerned the date may be fixed with a fair pretence to accuracy. If entire accuracy is demanded, our method "C" must be followed. (*See Arts. 2 and 126.*)

The details in cols. 5, and 6 to 9, are exactly accurate to the unit of a pala, or 24 seconds. The figure in brackets, or week-day index (*w*), is the remainder after casting out sevens from the number of days; thus, casting out sevens from 30 the remainder is 2, and this is the (*w*) for 30. To guard against mistakes it may be mentioned that the figure "2" does not of course mean that the Mesha or Vṛishabha saṅkrânti always takes place on (2) Monday.

106. *Tables IV. and V.* These tables give the value of (*w*) (week-day) and (*a*) (*b*) and

(*c*) for any required number of civil days, hours, and minutes, according to the *Sûrya Siddhânta*. It will be seen that the figures given in these Tables are calculated by the value for one day given in Art. 102.

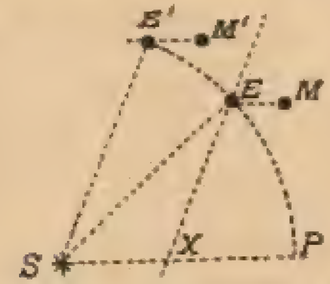
Table IV. is Prof. Jacobi's *Indian Antiquary* (Vol. XVII.) Table 7, slightly modified to suit our purposes; the days being run on instead of being divided into months, and the figures being given for the end of each period of 24 hours, instead of at its commencement. Table V. is Prof. Jacobi's Table 8.

107. *Tables VI. and VII.* These are Prof. Jacobi's Tables 9 and 10 re-arranged. It will be well that their meaning and use should be understood before the reader undertakes computations according to our method "C". It will be observed that the centre column of each column-triplet gives a figure constituting the equation for each figure of the argument from 0 to 1000, the centre figure corresponding to either of the figures to right or left. These last are given only in periods of 10 for convenience, an auxiliary Table being added to enable the proper equation to be determined for all arguments. Table VI. gives the lunar equation of the centre, Table VII. the solar equation of the centre. (*Art. 15 note 3 above*). The argument-figures are expressed in 1000ths of the circle, while the equation-figures are expressed in 10,000ths to correspond with the figures of our "*a*," to which they have to be added. Our (*b*) and (*c*) give the mean anomaly of the moon and sun for any moment, (*a*) being the mean longitudinal distance of the moon from the sun. To convert this last (*a*) into true longitudinal distance the equation of the centre for both moon and sun must be discovered and applied to (*a*) and these Tables give the requisite quantities. The case may perhaps be better understood if more simply explained. The moon and earth are constantly in motion in their orbits, and for calculation of a tithi we have to ascertain their relative positions with regard to the sun. Now supposing a railway train runs from one station to another twenty miles off in an hour. The average rate of running will be twenty miles an hour, but the actual speed will vary, being slower at starting and stopping than in the middle. Thus at the end of the first quarter of an hour it will not be quite five miles from the start, but some little distance short of this, say *m* yards. This distance is made up as full speed is acquired, and after three-quarters of an hour the train will be rather *more* than 15 miles from the start, since the speed will be slackened in approaching the station,—say *n* yards more than the 15 miles. These distances of *m* yards and *n* yards, the one in defect and the other in excess, correspond to the "Equation of the Centre" in planetary motion. The planetary motions are not uniform and a planet is thus sometimes behind, sometimes in front of, its mean or average place. To get the true longitude we must apply to the mean longitude the equation of the centre. And this last for both sun (or earth) and moon is what we give in these two Tables. All the requisite data for calculating the mean anomalies of the sun and moon, and the equations of the centre for each planet, are given in the Indian *Siddhântas* and *Karaṇas*, the details being obtained from actual observation; and since our Tables generally are worked according to the *Sûrya Siddhânta*, we have given in Tables VI. and VII. the equations of the centre by that authority.

Thus the Tables enable us to ascertain (*a*) the mean distance of moon from sun at any moment, (*b*) the correction for the moon's true (or apparent) place with reference to the earth, and (*c*) the correction for the earth's true (or apparent) place with reference to the sun; and with these corrections applied to the (*a*) we have the true (or apparent) distance of the moon from the sun, which marks the occurrence of the true (or apparent) tithi; and this result is our tithi-index, or (*t*). From this tithi-index (*t*) the tithi current at any given moment is found from Table VIII., and the time equivalent is found by Table X. Full explanation for actual work is given in Part IV. below (Arts. 139—160).

The method for calculating a nakshatra or yoga is explained in Art. 133.

108. Since the planet's true motion is sometimes greater and sometimes less than its mean motion it follows that the two equations of the centre found from (*b*) and (*c*) by our Tables VI. and VII. have sometimes to be added to and sometimes subtracted from the mean longitudinal distance (*a*), if it is required to find the true (or apparent) longitudinal distance (*t*). But to simplify calculation it is advisable to eliminate this inconvenient element, and to prepare the Tables so that the sum to be worked may always be one of addition. Now it is clear that this can be done by increasing every figure of each equation by its largest amount, and decreasing the figure (*a*) by the sum of the largest amount of both, and this is what has been done in the Tables. According to the *Sûrya Siddhânta* the greatest possible lunar equation of the centre is 5° 2′ 47″.17 (= .0140,2 in our tithi-index computation), and the greatest possible solar equation of the centre is 2° 10′ 32″.35 (= .0060,4). But the solar equation of the centre, or the equation for the earth, must be introduced into the figure representing the distance of the moon from the sun *with reversed sign*, because a positive correction to the earth's longitude implies a negative correction to the distance of moon from sun. This will be clear from a diagram.




Let S be the sun, M the moon, E the earth, P the direction of perigee. Then the angle SEM represents the distance of moon from sun. But if we add a positive correction to (*i.e.*, increase) the earth's longitude PSE and make it PSE' (greater than PSE by ESE') we thereby *decrease* the angle SEM to SE'M', and we decrease it by exactly the same amount, since the angle SEM = ∠ SE'M' + ∠ ESE', as may be seen if we draw the line EX parallel to E'S; for the angle SEX = ∠ ESE' by Euclid.

Every figure of each equation is thus increased in our Tables VI. and VII. by its greatest value, *i.e.*, that of the moon by 140.2 and that of the sun by 60.4, and every figure of (*a*) is decreased by the sum of both, or (140.2 + 60.4 =) 200.6.[1]

In conclusion, Table VI. yields the lunar equation of the centre calculated by the *Sûrya Siddhânta*, turned into 10,000ths of a circle, and increased by 140.2; and Table VII. yields the solar equation of the centre calculated by the *Sûrya Siddhânta*, with sign reversed, converted into 10,000ths of a circle, and increased by 60.4.[2] This explains why for argument 0 the equation given is lunar 140 and solar 60. If there were no such alteration made the lunar equation for Arg. 0 would be ± 0, for Arg. 250 (or 90°) + 140, for Arg. 500 (180°) ± 0, and for Arg. 750 (or 270°) —140, and so on.

109. The lunar and solar equations of the centre for every degree of anomaly are given

[1] Prof. Jacobi gives this as 200.5, but after most careful calculation I find it to be 200.6. [S. B. D.]

[2] Prof. Jacobi has not explained these Tables.

in the *Makaranda*, and from these the figures given by us for every $\frac{1}{1000}$th of a circle, or 10 units of the argument of the Tables, are easily deduced.

110. The use of the auxiliary Table is fully explained on the Table itself.

111. *Table VIII.* This is designed for use with our method *C*, the rules for which are given in Arts. 139—160. As regards the tithi-index, see Art. 80. The period of a nakshatra or yoga is the 27th part of a circle, that is 13° 20′ or $\frac{10000}{27} = 370\frac{10}{27}$. Thus, the index for the ending point of the first nakshatra or yoga is 370 and so on.[1] Tables VIII.A. and VIII.B. speak for themselves. They have been inserted for convenience of reference.

112. *Table IX.* is used in both methods *B* and *C*. See the rules for work.

113. *Table X.* (*See the rules for work by method C.*) The mean values in solar time of the several elements noted herein, as calculated by the *Sûrya-Siddhânta*, are as follow:—

| | | |
|---|---|---|
| A tithi | = 1417.46822 | minutes. |
| A lunation | = 42524.046642 | do. |
| A sidereal month | = 39343.21 | do. |
| A yoga-chakra | = 36605.116 | do. |

From these values the time-equivalents noted in this Table[2] have been calculated. (*See also note to Art. 82.*)

114. *Table XI.* This Table enables calculations to be made for observations at different places in India. (*See Art. 36, and the rules for working by our method C.*)

115. *Table XII.* We here give the names and numbers of the samvatsaras, or years of the sixty-year cycle of Jupiter, with those of the twelve-year cycle corresponding thereto. (*See the description of these cycles given above, Arts. 53 to 63.*)

116. *Table XIII.* This Table was furnished by Dr. Burgess and is designed to enable the week-day corresponding to any European date to be ascertained. It explains itself. Results of calculations made by all our methods may be tested and verified by the use of this Table.

117. *Tables XIV. and XV.* are for use by our method *A* (*see the rules*), and were invented and prepared by Mr. T. Lakshmiah Naidu of Madras.

*Table XVI.* is explained in Part V.

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## PART IV.

## USE OF THE TABLES.

118. The Tables now published may be used for several purposes, of which some are enumerated below.

(1) For finding the year and month of the Christian or any Indian era corresponding to a given year and month in any of the eras under consideration.

[1] This Table contains Prof. Jacobi's Table 11 (*Ind. Ant.*, *XVII.*, p. 147) and his Table 17, p. 181, in a modified form. [S. B. D.]

[2] The Table contains Prof. Jacobi's Table 11 (*Ind. Ant.*, *XVII.*, p. 172), as well as his Table 17 Part II. (*id.*, p. 181) modified and enlarged. I have also added the equivalents for tithi parts, and an explanation. [S. B. D.]

(2) For finding the samvatsara of the sixty-year cycle of Jupiter, whether in the southern (luni-solar) or northern (mean-sign) scheme, and of the twelve-year cycle of Jupiter, corresponding to the beginning of a solar (Meshâdi) year, or for any day of such a year.

(3) For finding the added or suppressed months, if any, in any year.

But the chief and most important use of them are;

(4) The conversion of any Indian date—luni-solar (tithi) or solar—into the corresponding date A.D. and vice versâ, from A.D. 300 to 1900, and finding the week-day of any such date;

(5) Finding the karaṇa, nakshatra, and yoga for any moment of any Indian or European date, and thereby verifying any given Indian date;

(6) Turning a Hindu solar date into a luni-solar date, and vice versâ.

(7) Conversion of a Muhammadan Hijra date into the corresponding date A.D., and vice versâ. This is fully explained in Part V. below.

119. (1) *For the first purpose* Table I., cols. 1 to 5, or Table II., must be used, with the explanation given in Part III. above. For eras not noted in these two Tables see the description of them given in Art. 71. In the case of obscure eras whose exact nature is not yet well known, the results will only be approximate.

(N.B.—It will be observed that in Table II., Part ii., portions of two solar months or of four [1] Christian months are made to correspond to a lunar month and vice versâ, and therefore that if this Table *only* be used the results may not be exact).

The following note, though not yielding very accurate results, will be found useful for finding the corresponding parts of lunar and solar months. The tithi corresponding to the Mesha-saṅkrânti can be approximately [2] found by comparing its English date (Table I., col. 13) with that of the luni-solar Chaitra śukla 1st (Table I., col. 19); generally the saṅkrântis from Vṛishabha to Tulâ fall in successive lunar months, either one or two tithis later than the given one. Tulâ falls about 10 tithis later in the month than Mesha; and the saṅkrântis from Vṛischika to Mîna generally fall on the same tithi as that of Tulâ. Thus, if the Mesha saṅkrânti falls on śukla pañchamî (5th) the Vṛishabha saṅkrânti will fall on śukla shashṭhî (6th) or saptamî (7th), the Mithuna saṅkrânti on śukla ashṭamî (8th) or navamî (9th), and so on.

120. (2) *For the samvatsara* of the southern sixty-year cycle see col. 6 of Table I., or calculate it by the rule given in Art. 62. For that of the sixty-year cycle of Jupiter of the mean sign system, according to *Sûrya Siddhânta* calculations, current at the beginning of the solar year, *i.e.*, at the true (or apparent) Mesha saṅkrânti, see col. 7 of Table I.; and for that current on any day in the year according to either the *Sûrya* or *Ârya Siddhântas*, use the rules in Art. 59. To find the samvatsara of the twelve-year cycle of the mean-sign system corresponding to that of the Jupiter sixty-year cycle see Table XII.

121. (3) *To find the added or suppressed month* according to the *Sûrya Siddhânta* by the true (apparent) system see col. 8 of Table I. throughout, and for an added month of the mean system according to either the Original or Present *Sûrya Siddhântas*, or by the *Ârya Siddhânta*, see col. 8*a* of Table I. for any year from A.D. 300 to 1100.

122. (4) *For conversion of an Indian date into a date A.D. and vice versâ, and to find the week day of any given date*, we give below three methods, with rules and examples for work.

123. The first method A (Arts. 135, 136), the invention of Mr. T. Lakshmiah Naidu of

1 Of course only two in a single case, but four during the entire period of 1600 years covered by our Tables.

2 The exact tithi can be calculated by Arts. 149 and 151.

Madras, is a method for obtaining approximate results without any calculation by the careful use of mere eye-tables, viz., Tables XIV. and XV. These, with the proper use of Table I., are alone necessary. But it must never be forgotten that this result may differ by one, or at the utmost two, days from the true one, and that it is not safe to trust to them unless the era and bases of calculation of the given date are clearly known. (*See Art. 126 below.*)

124. By our second method B (Arts. 137, 138), which follows the system established by Mr W. S. Krishnasvâmi Naidu of Madras, author of "*South Indian Chronological Tables*" (Madras 1889), and which is intended to enable an approximation to be made by a very simple calculation, a generally accurate correspondence of dates can be obtained by the use of Tables I., III., and IX. The calculation is so easy that it can be done in the head after a little practice. It is liable to precisely the same inaccuracies as method A, neither more nor less.

125. Tables II. and III. will also be sometimes required for both these methods.

126. The result obtained by either of these methods will thus be correct to within one or two days, and as often as not will be found to be quite correct; but there must always be an element of uncertainty connected with their use. If, however, the era and original bases of calculation of the given date are certainly known, the result arrived at from the use of these eye-Tables may be corrected by the week-day if that has been stated; since the day of the month and year will not be wrong by more than a day, or two at the most, and the day of the week will determine the corresponding civil day. Suppose, for instance, that the given Hindu date is Wednesday, Vaiśâkha śukla 5th, and it is found by method A or method B that the corresponding day according to European reckoning fell on a Thursday, it may be assumed, presuming that all other calculations for the year and month have been correctly made, that the civil date A.D. corresponding to the Wednesday is the real equivalentof Vaiśâkha śukla 5th. But these rough methods should never be trusted to in important cases. For a specimen of a date where the bases of calculation are not known see example xxv., Art. 160 below.

127. When Tables XIV. and XV. are once understood (and they are perfectly simple) it will probably be found advisable to use method A in preference to method B.

128. As already stated, our method "C" enables the conversion of dates to be made with precise accuracy; the exact moments of the beginning and ending of every tithi can be ascertained; and the corresponding date is obtained, simultaneously with the week-day, in the required reckoning.

129. The week-day for any European date can be found independently by Table XIII., which was supplied by Dr. Burgess.

131[1] (5) *To find the karaṇa, nakshatra, or yoga current on any Indian or European date: and to verify any Indian date.*

Method C includes calculations for the karaṇa, nakshatra and yoga current at any given moment of any given day, as well as the instants of their beginnings and endings; but for this purpose, if the given date is other than a tithi or a European date, it must be first turned into one or the other according to our rules (*Art. 139 to 152.*)

132. It is impossible, of course, to verify any tithi or solar date unless the week-day, nakshatra, karaṇa, or yoga, or more than one of these, is also given, but when this requirement is satisfied our method C will afford proof as to the correctness of the date. To verify a solar date it must first be turned into a tithi or European date. (*Art 134 or 149.*)

133. For an explanation of the method of calculating tithis and half-tithis (karaṇas) see Art. 107 above. Our method of calculation for nakshatras and yogas requires a little

1 Art. 130 has been omitted.

more explanation. The moon's nakshatra (Arts. 8, 38) is found from her apparent longitude. By our method C we shew how to find $t$ (= the difference of the apparent longitudes of sun and moon), and equation[1] $c$ (= the solar equation of the centre) for any given moment. To obtain ($t$) the sun's apparent longitude is subtracted from that of the moon, so that if we add the sun's apparent longitude to ($t$) we shall have the moon's apparent longitude. Our ($c$) (Table I., last column) is the sun's mean anomaly, being the mean sun's distance from his perigee. If we add the longitude of the sun's perigee to ($c$), we have the sun's mean longitude, and if we apply to this the solar equation of the centre (+ or —) we have the sun's apparent longitude.[2] According to the *Sûrya-Siddhânta* the sun's perigee has only a very slight motion, amounting to 3′ 5″.8 in 1600 years. Its longitude for A.D. 1100, the middle of the period covered by our Tables, was 257° 15′ 55″.7 or .7146.3 of a circle, and therefore this may be taken as a constant for all the years covered by our Tables.

Now, true or apparant sun = mean sun + equation of centre. But we have not tabulated in Table VII., col. 2, the exact equation of the centre; we have tabulated a quantity (say $x$) the value of which is expressed thus;—

$x = 60{,}4$—equation of centre (*see Art. 108*).

So that equation of centre $= 60{,}4 - x$.

Hence, apparent sun = mean sun $+ 60{,}4 - x$.

But mean sun $= c +$ perigee, (which is 7146,3 in tithi-indices.)

$= c + 7146{,}3$.

Hence apparent sun (which we call $s$) $= c + 7146{,}3 + 60{,}4 - x$.

$= c + 7206{,}7 - x$; or, say, $= c + 7207 - x$

where $x$ is, as stated, the quantity tabulated in col. 2, Table VII.

($c$) is expressed in 1000ths, while 7207 and the solar equation in Table VII. are given in 10000ths of the circle, and therefore we must multiply ($c$) by 10. $t + s =$ apparent moon $= n$ (the index of a nakshatra.) This explains the rule given below for work (*Art. 156*).

For a yoga, the addition of the apparent longitude of the sun ($s$) and moon ($n$) is required. $s + n = y$ (the index of a yoga.) And so the rule in Art. 159.

134. (6) *To turn a solar date into its corresponding luni-solar date and vice versâ.*

First turn the given date into its European equivalent by either of our three methods and then turn it into the required one. The problem can be worked direct by anyone who has thoroughly grasped the principle of these methods.

## Method A.

### APPROXIMATE COMPUTATION OF DATES BY USE OF THE EYE-TABLE.

This is the method invented by Mr. P. Lakshmiah Naidu, nephew of the late W. S. Krishnasvâmi Naidu of Madras, author of "South Indian Chronological Tables."

Results found by this method may be inaccurate by as much as two days, but not more. If the era and bases of calculation of the given Hindu date are clearly known, and if the given date mentions a week-day, the day found by the Tables may be altered to suit it. Thus, if the Table yield result Jan. 10th Thursday, but the inscription mentions the week-day as "Tuesday", then Tuesday, January 8th, may be assumed to be the correct date A.D. corresponding to the given Hindu date, if the principle on which the Hindu date was fixed is known. If not, this method must not be trusted to.

135. (A.) *Conversion of a Hindu solar date into the corresponding date A. D.* Work by the following rules, always bearing in mind that when using the Kaliyuga or Śaka year Hindus

[1] Equation $c$ is the equation in Table VII.

[2] Reference to the diagram in Art. 108 will make all this plain, if PSE be taken as the sun's mean anomaly, and ESE′ the equation of the centre. PSE′ + longitude of the sun's perigee being the sun's true or apparent longitude.

usually give the number of the expired year, and not that astronomically current, (*e.g.*, Kaliyuga 4904 means in full phrase "after 4904 years of the Kaliyuga had elapsed")—but when using the name of the cyclic year they give that of the one then current. All the years given in Table I. are current years. The Table to work by is Table XIV.

Rule I. From Table I., cols. 1 to 7, and Table II., as the case may be, find the year (current) and its initial date, and week-day (cols. 13, 14, Table I.). But if the given Hindu date belongs to any of the months printed in italics at the head of Table XIV., take the next following initial date and week day in cols. 13, 14 of Table I. The months printed in the heading in capitals are the initial months of the years according to the different reckonings.

Rule II. For either of the modes of reckoning given at the left of the head-columns of months, find the given month, and under it the given date.

Rule III. From the given date so found, run the eye to the left and find the week-day in the same line under the week-day number found by Rule I. This is the required week-day.

Rule IV. Note number in brackets in the same line on extreme left.

Rule V. In the columns to left of the *body* of the Table choose that headed by the bracket-number so found, and run the eye down till the initial date found by Rule I. is obtained.

Rule VI. From the month and date in the upper columns (found by Rule II.) run the eye down to the point of junction (vertical and horizontal lines) of this with the initial date found by Rule V. This is the required date A. D.

Rule VII. If the date A. D. falls on or after 1st January in columns to the right, it belongs to the next following year. If such next following year is a leap-year (marked by an asterisk in Table I.) and the date falls after February 28th in the above columns, reduce the date by one day.

N.B.—The dates A.D. obtained from this Table for solar years are Old Style dates up to 8th April, 1753, inclusive.

Example. Find date A.D. corresponding to 20th Panguni of the Tamil year Rudhirodgâri, Kali 4904 expired.

By Rule I. Kali 4905 current, 2 (Monday), 11th April, 1803.
" " II. Tamil Panguni 20.
" " III. (under "2") Friday.
" " IV. Bracket-number (5).
" " V. [Under (5)]. Run down to April 11th.
" " VI. (Point of junctions) March 31st.
" " VII. March 30th. (1804 is a leap year.)

*Answer.*—Friday, March 30th, 1804 N.S. (See example 11, p. 74.)

(B.) *Conversion of a date A.D. into the corresponding Hindu solar date.* (See Rule V., method B. Art. 137, p. 70.) Use Table XIV.

Rule I. From Tables I., cols. 1 to 7 and 13, 14, and Table II., as the case may be, find the Hindu year, and its initial date and week-day, opposite the given year A.D. If the given date falls before such initial date, take the next previous Hindu year and its initial date and week-day A.D.

Rule II. From the columns to the left of the *body* of Table XIV. find that initial date found by Rule I. which is in a line, when carrying the eye horizontally to the right, with the given A.D. date, and note point of junction.

Rule III. Note the bracket-figure at head of the column on left so selected.

Rule IV. From the point of junction (Rule II.) run the eye vertically up to the Hindu date-columns above, and select that date which is in the same horizontal line as the bracket-figure on the extreme left corresponding with that found by Rule III. This is the required date.

Rule V. If the given date falls in the columns to the right after the 28th February in a leap-year (marked with an asterisk in Table I.), add 1 to the resulting date.

Rule VI. From the date found by Rule IV. or V., as the case may be, carry the eye horizontally to the week-day columns at the top on the left, and select the day which lies under the week-day number found from Table I. (Rule I.). This is the required week-day.

Rule VII. If the Hindu date arrived at falls under any of the months printed in italics in the Hindu month-columns at head of Table, the required year is the one next previous to that given in Table I. (Rule I.).

EXAMPLE. Find the Tamil solar date corresponding to March 30th, 1804 (N.S.).

(By Rule I.) Rudhirodgâri, Kali 4905 current. 2 (Monday) April 11th. (March 30th precedes April 11th.)

(By Rules II., III.) The point of junction of March 30th (body of Table), and April 11th, (columns on left) is under "(4)." Other entries of April 11th do not correspond with any entry of March 30).

(By Rule IV.) The date at the junction of the vertical column containing this "March 30th" with "(4)" horizontal is 19th Pañguni.

(By Rule V.) (1804 is a leap-year) 20th Pañguni.

(By Rule VI.) Under "2" (Rule I.), Friday.

*Answer.*—Friday, 20th Pañguni, of Rudhirodgâri, Kali 4905 current. (See example 15, p. 76.

136. (A.) *Conversion of a Hindu luni-solar date into the corresponding date A.D.* Work by the following rules, using Tables XV.A., and XV.B.

Rule I. From Table I. find the current year and its initial day and week-day in A.D. reckoning, remembering that if the given Hindu date falls in one of the months printed in italics at the head of Table XV. the calculation must be made for the next following A.D. year. (The months printed in capitals are the initial months of the years according to the different reckonings enumerated in the column to the left.)

Rule II. (*a.*) Find the given month, and under it the given date, in the columns at the head of Table XV., in the same line with the appropriate mode of reckoning given in the column to the left. The dates printed in black type are kṛishṇa, or dark fortnight, dates.

(*b.*) In intercalary years (cols. 8 to 12, 8*a* to 12*a* of Table I.), if the given month is itself an adhika mâsa (intercalary month), read it, for purpose of this Table, as if it were not so; but if the given month is styled *nija*, or if it falls after a repeated month, but before an expunged one (if any), work in this Table for the month next following the given one, as if that and not the given month had been given. If the given month is preceded by both an intercalated and a suppressed month, work as if the year were an ordinary one.

Rule III. From the date found by Rule II. carry the eye to the left, and find the week-day in the same horizontal line, but directly under the initial week-day found by Rule I.

Rule IV. Note the number in brackets on the extreme left opposite the week-day last found.

Rule V. In the columns to the left of the body of the Table choose that headed by the

bracket-number so found, and run the eye down till the initial date found by Rule I. is obtained.

Rule VI. From the Hindu date found by Rule II. run the eye down to the point of junction, (vertical and horizontal lines) of this date with the date found by Rule V. The result is the required date A.D.

Rule VII. (*a*.) If the date A.D. falls on or after January 1st in the columns to the right, it belongs to the next following year A.D.

(*b*.) If it is after February 28th in a leap-year (marked by an asterisk in col. 5, Table I.) reduce the date by one day, except in a leap-year in which the initial date (found in Table I.) itself falls after February 28th.

(*c*.) The dates obtained up to April 3rd, A.D. 1753, are Old Style dates.

EXAMPLE. To find the date A.D. corresponding to amânta Kârttika kṛishṇa 2nd of Kali 4923 expired, Śaka 1744 expired, Kârttikâdi Vikrama 1878 expired, Chaitrâdi Vikrama 1879 expired (1880 current), "Vijaya" in the Bṛihaspati cycle, "Chitrabhânu" in the luni-solar 60-year cycle.

(By Rule I.) (Kali 4924 current), 1 Sunday, March 24th, 1822.

(By Rule II.) (Kârttika, the 8th month, falls after the repeated month, 7 Âśvina, and before the suppressed month, 10 Pausha), Mârgaśîrsha kṛishṇa 2nd.

(By Rule III.) (Under "1"), 1 Sunday.

(By Rule IV.) Bracket-number (1).

(By Rule V.) Under (1) run down to March 24th (Rule I.)

(By Rule VI.) (Point of junction) December 1st.

*Answer.*—Sunday, December 1st, 1822.

(B.) *Conversion of a date A. D. into the corresponding luni-solar Hindu date* (See Rule V. method B, p. 67 below). Use Tables XV.A., XV.B.

Rule I. From Table I. find the Hindu year, and its initial date and week-day, using also Table II., Parts ii., iii. If the given date falls before such initial date take the next previous Hindu year, and its initial date and week-day.

Rule II. In the columns to the left of the body of Table XV. note the initial date found by Rule I., which is in the same horizontal line with the given date in the body of the Table.

Rule III. Carrying the eye upwards, note the bracket-figure at the head of the initial date-column so noted.

Rule IV. From the given date found in the body of the Table (Rule II.) run the eye upwards to the Hindu date-columns above, and select the date which is in the same horizontal line as the bracket-figure in the extreme left found by Rule III. This is the required Hindu date.

Rule V. Note in Table I. if the year is an intercalary one (cols. 8 to 12, and 8*a* to 12*a*). If it is so, note if the Hindu month found by Rule IV. (*a*) precedes the first intercalary month, (*b*) follows one intercalated and one suppressed month, (*c*) follows an intercalated, but precedes a suppressed month, (*d*) follows two intercalated months and one suppressed month. In cases (*a*) and (*b*) work as though the year were a common year, *i.e.*, make no alteration in the date found by Rule IV. In cases (*c*) and (*d*) if the found month immediately follows the intercalated month, the name of the required Hindu month is to be the name of the intercalated month with the prefix "nija," and not the name of the month actually found; and if the found month does not immediately follow the intercalated month, then the required Hindu month is the month immediately preceding the found month. If the found month is itself intercalary, it retains its name, but with the prefix "adhika." If the found month is itself suppressed, the required month is the month immediately preceding the found month.

Rule VI. If the given date A.D. falls after February 29th in the columns to the right, in a leap-year (marked with an asterisk in Table I.), add 1 to the resulting Hindu date.

Rule VII. From the date found by Rule IV. carry the eye horizontally to the week-day columns on the left, and select the day which lies under the initial week-day number found by Rule I. This is the required week-day.

Rule VIII. If the Hindu date arrived at falls under any of the months printed in italics in the Hindu month-columns at head of the table, the required year is the one next previous to that given by Table I. (Rule I. above.)

EXAMPLE. Find the Telugu luni-solar date corresponding to Sunday, December 1st, 1822.

(By Rule I.) A.D. 1822—23, Sunday, March 24th, Kali 4923 expired, Śaka 1744 expired, Chitrabhânu samvatsara in the luni-solar 60-year or southern cycle reckoning, Vijaya in the northern cycle.

(By Rules II., III.) (Bracket-figure) 1.

(By Rule IV.) Mârgaśîrsha kṛishṇa 2nd.

(By Rule V*c*.) (Âśvina being intercalated and Pausha suppressed in that year), Kârttika kṛishṇa 2nd.

(By Rule VI.) The year was not a leap-year.

(By Rule VII.) Sunday.

(By Rule VIII.) Does not apply.

*Answer.*—Sunday, Kârttika kṛishṇa 2nd, Kali 4923 expired, Saka 1744 expired. (This can be applied to all Chaitrâdi years.) (See example 12 below, p. 75.)

## Method B.

### APPROXIMATE COMPUTATION OF DATES BY A SIMPLE PROCESS.

This is the system introduced by Mr. W. S. Krishnasvâmi Naidu of Madras into his "South-Indian Chronological Tables."

137. (A.) *Conversion of Hindu dates into dates A.D.* (See Art. 135 above, para. 1.)

Rule I. Given a Hindu year, month and date. Convert it if necessary by cols. 1 to 5 of Table I., and by Table II., into a Chaitrâdi Kali or Śaka year, and the month into an amânta month. (See Art. 104.) Write down in a horizontal line (*d*) the date-indicator given in brackets in col. 13 or 19 of Table I., following the names of the initial civil day and month of the year in question as so converted, and (*w*) the week-day number (col. 14 or 20) corresponding to the initial date A.D. given in cols. 13 or 19. To both (*d*) and (*w*) add, from Table III., the collective duration of days from the beginning of the year as given in cols. 3*a* or 10 as the case may be, up to the end of the month preceding the given month, and also add the number of given Hindu days in the given month minus 1. If the given date is luni-solar and belongs to the kṛishṇa paksha, add 15 to the collective duration and proceed as before.

Rule II. From the sum of the first addition find in Table IX. (top and side columns)

the required English date, remembering that when this is over 365 in a common year or 366 in a leap-year the date A.D. falls in the ensuing A.D. year.

Rule III. From the sum of the second addition cut out sevens. The remainder shews the required day of the week.

Rule IV. If the Hindu date is in a luni-solar year where, according to cols. 8 to 12, there was an added (*adhika*) or suppressed (*kshaya*) month, and falls after such month, the addition or suppression or both must be allowed for in calculating the collective duration of days; *i.e.*, add 30 days for an added month, and deduct 30 for a suppressed month.

Rule V. The results are Old Style dates up to, and New Style dates from, 1752 A.D. The New style in England was introduced with effect from after 2nd September, 1752. Since the initial dates of 1752, 1753 only are given, remember to apply the correction (+ 11 days) to any date between 2nd September, 1752, and 9th April, 1753, in calculating by the Hindu solar year, or between 2nd September, 1752, and 4th April, 1753, in calculating by the Hindu luni-solar year, so as to bring out the result in New Style dates A.D. The day of the week requires no alteration.

Rule VI. If the date A.D. found as above falls after February 29th in a leap-year, it must be reduced by one day.

## *(a) Luni-Solar Dates.*

EXAMPLE 1. Required the A.D. equivalent of (luni-solar) Vaiśâkha śukla shashṭhî (6th), year Śârvari, Śaka 1702 expired, (1703 current).

The A.D. year is 1780 (a leap-year). The initial date (*d*) = 5th April (96), and (*w*) = 4 Wednesday, (Table I., cols. 5, 19, 20).

| | *d.* | *w.* |
|---|---|---|
| State this accordingly . . . . . . . | 96 | 4 |
| Collective duration (Table III., col. 3*a*) | 30 | 30 |
| Given date (6)—1 . . . . . . . . . | 5 | 5 |
| | 131 | |
| | 1 (Rule VI.) | |
| | 130 | 39÷7 = Rem. 4 |

The result gives 130 (Table IX.) = May 10th, and 4 = Wednesday. The required date is therefore Wednesday, May 10th, A.D. 1780.

EXAMPLE 2. Required the A.D. equivalent of (luni-solar) Kârttika śukla pañchamî (5th) Saka 1698 expired (1699 current).

The A.D. year is 1776, and the initial date is (*d*) = 20th March (80), (*w*) = Wednesday (4). This is a leap-year, and the Table shews us that the month (6) Bhâdrapada was intercalated. So there is both an adhika Bhâdrapada and a nija Bhâdrapada in this year, which compels us to treat the given month Kârttika as if it were the succeeding month Mârgasîrsha in order to get at the proper figure for the collective duration.

| | d. | w. |
|---|---|---|
| The given figures are . . . | 80 | 4 |
| Collective duration (Table III.) for Mârgaśîrsha . . . . | 236 | 236 |
| Given date (5)—1 . . . . . | 4 | 4 |
| | 320 | |
| | —1 (Rule VI.) | |
| | 319 | 244 ÷ 7 = Rem. 6. |

319 = (Table IX.) November 15th. 6 = Friday

*Answer.*—Friday, November 15th, A.D. 1776.

EXAMPLE 3. Required the A.D. equivalent of Kârttika krishna pañchamî (5th) of the same luni-solar year.

| | d. | w. |
|---|---|---|
| As before . . . . . . . . . . . . | 80 | 4 |
| Collective duration (Table III., col. 3a.) | 236 | 236 |
| Given date (5 + 15)—1 . . . . . . | 19 | 19 |
| | 335 | |
| | —1 (Rule VI.) | |
| | 334 | 259 ÷ 7, Rem. 0. |

334 = (Table IX.) November 30th. 0 = Saturday.

*Answer.*—Saturday, November 30th, A.D. 1776.

EXAMPLE 4. Required the A.D. equivalent of Mâgha krishna pâdyami (1st) of K.Y. 4923 expired (4924 current). This corresponds (Table I., col. 5) to A.D. 1822, the Chitrabhânu samvatsara, and col. 8 shews us that the month Âśvina was intercalated *(adhika)*, and the month Pausha suppressed *(kshaya)*. We have therefore to add 30 days for the adhika month and subtract 30 days for the kshaya month, since Mâgha comes after Pausha. Hence the relative place of the month Mâgha remains unaltered.

Table I. gives 24th March (83), (1) Sunday, as the initial day.

| | d. | | w. |
|---|---|---|---|
| Initial date . . . . . . . . . . . . . | 83 | | 1 |
| Collective duration (Table III., col. 3a) . | 295 | | 295 |
| Given date (1 + 15)—1 . . . . . . . . | 15 | (Rule I.) | 15 |
| | 393 | | 311 ÷ 7. Rem. 3. |

3 = Tuesday. 393 = January 28th of the following A.D. year (Table IX.).

*Answer.*—Tuesday, January 28th, A.D. 1823.

This is correct by the Tables, but as there happened to be an expunged tithi in Mâgha sukla, the first fortnight of Mâgha, the result is wrong by one day. The corresponding day was really Monday, January 27th, and to this we should have been guided if the given date had included the mention of Monday as the week-day. That is, we should have fixed Monday, January 27th, as the required day A.D. because our result gave Tuesday, January 28th, and we knew that the date given fell on a Monday.

EXAMPLE 5. Required the A.D. equivalent of Pausha śukla trayodaśî (13th) K.Y. 4853 expired, Aṅgiras samvatsara in luni-solar or southern reckoning. This is K. Y. 4854 current.

The year (Table I., col. 5) is A.D. 1752, a leap-year. The initial date (cols. 19, 20) is 5th March (65), (5) Thursday. The month Âshâḍha was intercalated. Therefore the given month (Pausha) must be treated, for collective duration, as if it were the succeeding month Mâgha.

| | *d.* | *w.* |
|---|---|---|
| Initial date . . . . . . . . . . | 65 | 5 |
| Collective duration (Table III., col. 3a) | 295 | 295 |
| Given date (13)—1 . . . . . . . . | 12 | 12 |
| | 372 | |
| | —1 (Rule VI) | |
| | 371 | 312 ÷ 7, Rem. 4. |

We must add eleven days to the amount 371 to make it a New Style date, because it falls after September 2nd, 1752, and before 4th April, 1753, (after which all dates will be in New Style by the Tables). 371 + 11 = 382 = January 17th (Table IX.). 4 = Wednesday.

*Answer.*—**Wednesday, January 17th, A.D. 1753.**

EXAMPLE 6. Required the A.D. equivalent of Vikrama samvatsara 1879 Âshâḍha kṛishṇa dvitîyâ (2nd). If this is a southern Vikrama year, as used in Gujarât, Western India, and countries south of the Narmadâ, the year is Kârttikâdi and amânta, *i.e.*, the sequence of fortnights makes the month begin with sukla 1st. The first process is to convert the date by Table II., Part iii., col. 3, Table II., Part ii., and Table I., into a Chaitrâdi year and month. Thus—Âshâḍha is the ninth month of the year and corresponds to Âshâḍha of the following Chaitrâdi Kali year, so that the given month Âshâḍha of Vikrama 1879 corresponds to Âshâḍha of Kali 4924. Work as before, using Table I. for Kali 4924. Initial date, 24th March (83), (1) Sunday.

| | *d.* | *w.* |
|---|---|---|
| Initial date . . . . . . . . . . | 83 | 1 |
| Collective duration (Table III., col. 3*a*) | 89 | 89 |
| Given date (2 + 15)—1 . . . . . . | 16 | 16 |
| | 188 | 106÷7 Rem. 1 |

188 (Table IX.) = July 7th. 1 = Sunday.

*Answer.*—**Sunday, July 7th, A.D. 1822.**[1]

If the year given be a northern Vikrama year, as used in Mâlwa, Benares, Ujjain, and countries north of the Narmadâ, the Vikrama year is Chaitrâdi and corresponds to the Kali 4923, except that, being pûrṇimânta, the sequence of fortnights differs (see Table II., Part i.). In such a case Âshâḍha kṛishṇa of the Vikrama year corresponds to Jyeshṭha krishna in amânta months, and we must work for Kali 4923 Jyeshṭha kṛishṇa 2nd. By Table I. the initial date is April 3rd (93), (3) Tuesday. The A.D. year is 1821—22.

[1] This is actually wrong by one day, owing to the approximate collective duration of days (Table III., 8*a*) being taken as 89. It might equally well be taken as 88. If it is desired to convert tithis into days (p. 75, note 2) a 64th part should be subtracted. The collective duration of the last day of Jyeshṭha in tithis is 90. 90 ÷ 64 = 1.40. 90 — 1.40 = 88.60. If taken as 88 the answer would be Saturday, July 6th, which is actually correct. This serves to shew how errors may arise in days when calculation is only made approximately.

| | *d.* | *w.* |
|---|---|---|
| | 93 | 3 |
| Collective duration (Table III., col. 3*a*) | 59 | 59 |
| Given date (2 + 15)—1 . . . . . . | 16 | 16 |
| | 168 | 78÷7, Rem. 1. |

168 = June 17th. 1 = Sunday.

*Answer.*—Sunday, June 17th, A.D. 1821.

### *(b) Solar Dates.*

EXAMPLE 7. Required the date A.D. corresponding to the Tamil (solar) 18th Puraṭṭâsi of Rudhirodgârin = K.Y. 4904 expired, or 4905 current.

Table I., cols. 13 and 14, give (*d*) = April 11th (101), (*w*) = (2) Monday, and the year A.D. 1803.

| | *d.* | *w.* |
|---|---|---|
| Initial date . . . . . . . . . . | 101 | 2 |
| Collective duration (Table III., col. 10) | 156 | 156 |
| Given date (18)—1 . . . . . . . | 17 | 17 |
| | 274 | 175÷7, Rem. 0. |

274 (Table IX.) gives October 1st. 0 = Saturday.

*Answer.*—Saturday, October 1st, A.D. 1803.

EXAMPLE 8. Required the equivalent A.D. of the Tinnevelly Âṇḍu 1024, 20th Âvaṇi.

The reckoning is the same as the Tamil as regards months, but the year begins with Âvaṇi. Âṇḍu 1024 = K.Y. 4950. It is a solar year beginning (see Table I.) 11th April (102), (3) Tuesday, A.D. 1848 (a leap-year).

| | *d.* | *w.* |
|---|---|---|
| Initial date . . . . . . . . . . . . . . . | 102 | 3 |
| Tables II., Part ii., cols. 10 & 7, and III., col. 10. | 125 | 125 |
| Given date (20)—1 . . . . . . . . . . . | 19 | 19 |
| | 246 | |
| | —1 (Rule VI.) | |
| | 245 | 147 ÷ 7, Rem. 0. |

0 = Saturday; 245 = (Table IX.) September 2nd.

*Answer.*—Saturday, September 2nd, A.D. 1848.

EXAMPLE 9. Required the equivalent date A.D. of the South Malayâḷam Âṇḍu 1024, 20th Chiṅgam. The corresponding Tamil month and date (Table II., Part ii., cols. 9 and 11) is 20th Âvaṇi K.Y. 4950, and the answer is the same as in the last example.

EXAMPLE 10. Required the equivalent date A.D. of the North Malayâḷam (Kollam) Âṇḍu 1023, 20th Chiṅgam. This (Chiṅgam) is the 12th month of the Kollam Âṇḍu year which begins with Kanni. It corresponds with the Tamil 20th Âvaṇi K.Y. 4950 (Table II., Part ii., cols. 9, 12, and Table II., Part iii.), and the answer is similar to that in the two previous examples. The difference in the years will of course be noted. The same Tamil date corresponds

to South Malayâḷam Âṇḍu 1024, 20th Chiṅgam, and to the same day of the month in the North Malayâḷam (Kollam) Âṇḍu 1023, the reason being that in the former reckoning the year begins with Chiṅgam, and in the latter with Kanni.]

EXAMPLE 11. Required the A.D. equivalent of the Tamil date, 20th Paṅguni of Rudhirodgârin, K.Y. 4905 current (or 4904 expired.)

Table I. gives (*d*) 11th April (101), 1803 A.D. as the initial date of the solar year, and its week-day (*w*) is (2) Monday.

| | *d.* | *w.* |
|---|---|---|
| Initial date . . . . . . . . . . . . | 101 | 2 |
| Collective duration (Table III., col. 10) | 335 | 335 |
| Given date, (20)—1 . . . . . . . | 19 | 19 |
| | 455 | |
| | —1 (Rule VI.) | |
| | 454 | 356 ÷ 7, Rem. 6. |

6 = Friday: 454 (Table IX.) = March 30th in the following A.D. year, 1804. *Answer.*—Friday, March 30th, 1804. (See example 1, above.)

138. (B.) *Conversion of dates A.D. into Hindu dates.* (See Art. 135 above, par. 1.)

Rule I. Given a year, month, and date A.D. Write down in a horizontal line (*d*) the date-indicator of the initial date [in brackets (Table I., cols. 13 or 19, as the case may be)] of the corresponding Hindu year required, and (*w*) the week-day number of that initial date (col. 14 or 20), remembering that, if the given date A.D. is earlier than such initial date, the (*d*) and (*w*) of the previous Hindu year must be taken. Subtract the date-indicator from the date number of the given A.D. date in Table IX., remembering that, if the previous Hindu year has been taken down, the number to be taken from Table IX. is that on the right-hand side of the Table and not that on the left. From the result subtract (Table III., col. 3*a* or 10) the collective-duration-figure which is nearest to, but lower than, that amount, and add 1 to the total so obtained; and to the (*w*) add the figure resulting from the second process under (*d*), and divide by 7. The result gives the required week-day. The resulting (*d*) gives the day of the Hindu month following that whose collective duration was subtracted.

Rule II. Observe (Table I., cols. 8 or 8a) if there has been an addition or suppression of a month prior to the month found by Rule I. and proceed accordingly.

An easy rule for dealing with the added and suppressed month is the following. When the intercalated month (Table I., col. 8 or 8a) precedes the month immediately preceding the one found, such immediately preceding month is the required month; when the intercalated month immediately precedes the one found, such immediately preceding month with the prefix "nija," natural, is the required month; when the intercalated month is the same as that found, such month with the prefix "adhika" is the required month. When a suppressed month precedes the month found, the required month is the same as that found, because there is never a suppression of a month without the intercalation of a previous month, which nullifies the suppression so far as regards the collective duration of preceding days. But if the given month falls after two intercalations and one suppression, act as above for one intercalation only.

Rule III. See Art. 137 (A) Rule V. (p. 70), but subtract the eleven days instead of adding.

Rule IV. If the given A.D. date falls in a leap-year after 29th February, or if its date-number

(right-hand side of Table IX.) is more than 365, and the year next preceding it was a leap-year, add 1 to the date-number of the given European date found by Table IX., before subtracting the figure of the date-indicator

Rule V. Where the required date is a Hindu luni-solar date the second total, if less than 15, indicates a śukla date. If more than 15, deduct 15, and the remainder will be a kṛishṇa date. Kṛishṇa 15 is generally termed kṛishṇa 30; and often śukla 15 is called "pûrṇimâ" (full-moon day), and kṛishṇa 15 (or "30") is called amâvâsyâ (new-moon day).

### (*a*) *Luni-Solar Dates.*

Example 12. Required the Telugu or Tuḷu equivalent of December 1st, 1822. The luni-solar year began 24th March (83) on (1) Sunday (Table I., cols. 19 and 20.)

| | *d.* | *w.* |
|---|---|---|
| (*d*) and (*w*) of initial date (Table I.) . . . . . . . | 83 | 1 |
| (Table IX.) 1st December (335) . . . . . . | (335— 83 =)252 | 252 |
| (Table III.) Collective duration to end of Kârttika | —236 | |
| Add 1 to remainder . . . . . . . . . . . . . | 16 + 1 = 17 | 253 ÷ 7, Rem. 1. |

17 indicates a kṛishṇa date. Deduct 15. Remainder 2. The right-hand remainder shews (1) Sunday.

The result so far is Sunday Mârgaśirsha kṛishṇa 2nd. But see Table I., col. 8. Previous to this month Âśvina was intercalated. (The suppression of Pausha need not be considered because that month comes after Mârgaśirsha.) Therefore the required month is not Mârgaśirsha, but Kârttika; and the answer is Sunday Kârttika kṛishṇa 2nd (Telugu), or Jarde (Tuḷu), of the year Chitrabhânu, K.Y. 4923 expired, Saka 1744 expired. (See the example on p. 69.)

(*Note.*) As in example 6 above, this date is actually wrong by one day, because it happened that in Kârttika śukla there was a tithi, the 12th, suppressed, and consequently the real day corresponding to the civil day was Sunday Kârttika kṛishṇa 3rd. These differences cannot possibly be avoided in methods A and B, nor by any method unless the duration of every tithi of every year be separately calculated. (See example xvii., p. 92.)

Example 13. Required the Chaitrâdi Northern Vikrama date corresponding to April 9th 1822. By Table I. A.D. 1822—23 = Chaitrâdi Vikrama 1880 current. The reckoning is luni-solar. Initial day (*d*) March 24th (83), (*w*) 1 Sunday

| | *d.* | *w.* |
|---|---|---|
| From Table I. . . . . . . . . . . . . . . . . . . | 83 | 1 |
| (Table IX.) April 9th (99) . . . . . . . . . . . | 99—83 = 16 | 16 |
| Add . . . . . . . . . . . . . . . . . . . . | 1 | |
| | 17 | |
| For śukla dates . . . . . . . . . . . . . . . . | —15 | |
| | 2 | 17 ÷ 7, Rem. 3. |

This is Tuesday, amânta Chaitra kṛishṇa 2nd.[1] But it should be converted into Vaiśâkha kṛishṇa 2nd, because of the custom of beginning the month with the full-moon (Table II., Part i.).

[1] The actual date was Tuesday, amânta Chaitra krishṇa 3rd, the difference being caused by a tithi having been expunged in the sukla fortnight of the same month (*see note in examples 6 and 12 above*).

Since the Chaitrâdi Vikrama year begins with Chaitra, the required Vikrama year is 1880 current, 1879 expired. But if the required date were in the Southern reckoning, the year would be 1878 expired, since 1879 in that reckoning does not begin till Kârttika.

(*b*) *Solar Dates.*

EXAMPLE 14. 1. Required the Tamil equivalent of May 30th, 1803 A.D.

Table I. gives the initial date April 11th (101), and week-day number 2 Monday.

| | *d.* | *w.* |
|---|---|---|
| From Table I. . . . . . . . . . . . . . . . . . . | 101 | 2 |
| (Table IX.) May 30th (150) . . . . . . . . . . . | 150—101 = 49 | 49 |
| (Table III.) Collective duration to end of Śittirai (Mesha) . | —31 | |
| | 18 | |
| Add 1 . . . . . . . . . . . . . . . . . . . . | + 1 | |
| | 19 | 51 ÷ 7, Rem. 2. |

The day is the 19th; the month is Vaiyâśi, the month following Śittirai; the week-day is (2) Monday.

*Answer.*—Monday, 19th Vaiyâśi of the year Rudhirodgârin. K.Y. 4904 expired, Śaka 1725 expired.

EXAMPLE 15. Required the Tamil equivalent of March 30th, 1804. The given date precedes the initial date in 1804 A.D. (Table I., col. 13) April 10th, so the preceding Hindu year must be taken. Its initial day is 11th April (101), and the initial week-day is (2) Monday. 1804 was a leap-year.

| | *d.* | *w.* |
|---|---|---|
| From Table I. . . . . . . . . . . . . . . . | 101 | 2 |
| (Table IX.) (March 30th) 454 + 1 for leap-year, 455—101 = | 354 | 354 |
| (Table III., col. 10) Collective duration to end of Mâśi = Kumbha (Table II., Part ii.) . . . . | —335 | |
| | 19 | |
| Add 1 . . . . . . . . . . . . . . . . | + 1 | |
| | 20 | 356 ÷ 7, Rem. 6. |

*Answer.*—Friday 20th Panguṇi of the year Rudhirodgârin K.Y. 4904 expired, Śaka 1725 expired. (See the example on p. 67.)

EXAMPLE 16. Required the North Malayaḷam Âṇḍu equivalent of September 2nd, 1848. Work as by the Chaitrâdi year. The year is solar. 1848 is a leap-year.

| | *d.* | *w.* |
|---|---|---|
| From Table I. . . . . . . . . . . . . . . | 102 | 3 |
| (Table IX.) September 2nd (245) + 1 for leap year . . . . . . . . . . . . . . 246 — 102 = | 144 | 144 |
| Coll. duration to end of Karka . . . . . . . . | —125 | |
| | 19 | |
| Add 1 . . . . . . . . . . . . . . . | + 1 | |
| | 20 | 147 ÷ 7, Rem. 0 |

*Answer.*—Saturday 20th Chiṅgam. This is the 12th month of the North Malayâḷam Âṇḍu which begins with Kanni. The year therefore is 1023.

If the date required had been in South Malayâḷam reckoning, the date would be the same, 20th Chiṅgam, but as the South Malayâlis begin the year with Chiṅgam as the first month, the required South Malayâḷam year would be Âṇḍu 1024.

## Method C.

### EXACT CALCULATION OF DATES.

### (A.) *Conversion of Hindu luni-solar dates into dates A.D.*

139. *To calculate the week-day, the equivalent date A.D., and the moment of beginning or ending of a tithi.* Given a Hindu year, month, and tithi.—Turn the given year into a Chaitrâdi Kali, Śaka, or Vikrama year, and the given month into an amânta month (if they are not already so) and find the corresponding year A.D., by the aid of columns 1 to 5 [1] of Table I., and Table II., Parts i., ii., iii. Referring to Table I., carry the eye along the line of the Chaitrâdi year so found, and write down [2] in a horizontal line the following five quantities corresponding to the day of commencement (Chaitra śukla pratipadâ) of that Chaitrâdi-year, viz., (*d*) the date-indicator given in brackets after the day and month A.D. (Table I., col. 19), (*w*) the week-day number (col. 20), and (*a*), (*b*), (*c*) (cols. 23, 24, 25). Find the number of tithis which have intervened between the initial day of the year (Chaitra śukla pratipadâ), and the given tithi, by adding together the number of tithis (collective duration) up to the end of the month previous to the given one (col. 3, Table III.), and the number of elapsed tithis of the given month (that is the serial number of the given tithi reduced by one), taking into account the extra 15 days of the śukla paksha if the tithi belongs to the kṛishṇa paksha, and also the intervening intercalary month,[3] if any, given in col. 8 (or 8*a*) of Table I. This would give the result in tithis. But days, not tithis, are required. To reduce the tithis to days, reduce the sum of the tithis by its 60th part,[4] taking fractions larger than a half as one, and neglecting half or less. The result is the (*d*), the approximate number of days which have intervened since the initial day of the Hindu year. Write this number under head (*d*), and write under their respective heads, the (*w*), (*a*), (*b*), (*c*) for that number of days from Table IV. Add together the two lines of five quantities, but in the case of (*w*) divide the result by 7 and write only the remainder, in the case of (*a*) write only the remainder under 10000, and in the case of (*b*) and (*c*) only the remainder under 1000.[5] Find separately the equations to arguments (*b*) and (*c*) in Tables VI. and VII. respectively, and add them to the total under (*a*). The sum (*t*) is the tithi-index, which, by cols. 2 and 3 of Table VIII., will indicate the tithi current at mean sunrise on the week-day found under (*w*). If the number of the tithi so indicated is not the same as that of the given one, but is greater or less by one (or by two in rare cases), subtract one (or two) from, or add

1 The initial days in cols. 19 and 19, Table I., belong to the first of the double years A.D. given in col. 5.

2 It will be well for a beginner to take an example at once, and work it out according to the rule. After a little practice the calculations can be made rapidly.

3 When the intercalary month is Chaitra, count that also. See Art. 99 above.

4 This number is taken for easy calculation. Properly speaking, to convert tithis into days the 64th part should be subtracted. The difference does not introduce any material error.

5 Generally with regard to (*w*), (*a*), (*b*), (*c*) in working addition sums, take only the remainder respectively over 7, 10000, 1000 and 1000; and in subtracting, if the sum to be subtracted be greater, add respectively 7, 10000, 1000 and 1000 to the figure above.

one (or two) to. both (*d*) and (*w*);[1] subtract from, or add to, the (*a*) (*b*) (*c*) already found, their value for one (or two) days (Table IV.); add to (*a*) the equations for (*b*) and (*c*) (Tables VI. and VII.) and the sum (*t*) will then indicate the tithi. If this is the same as given (if not, proceed again as before till it corresponds), the (*w*) is its week-day, and the date shewn in the top line and side columns of Table IX. corresponding with the ascertained (*d*) is its equivalent date A.D. The year A.D. is found on the line of the given Chaitrâdi year in col. 5, Table I. Double figures are given in that column; if (*d*) is not greater than 365 in a common year, or 366 in a leap-year, the first, otherwise the second, of the double figures shows the proper A.D. year.

140. For all practical purposes and for some ordinary religious purposes a tithi is connected with that week-day at whose sunrise it is current. For some religious purposes, however, and sometimes even for practical purposes also, a tithi which is current at any particular moment of a week-day is connected with that week-day. (*See Art. 31 above.*)

141. In the case of an expunged tithi, the day on which it begins and ends is its week-day and equivalent. In the case of a repeated tithi, both the civil days at whose sunrise it is current,[2] are its week-days and equivalents.

142. *A clue for finding when a tithi is probably repeated or expunged.* When the tithi-index corresponding to a sunrise is greater or less, within 40, than the ending index of a tithi, and when the equation for (*b*) (Table VI.) is decreasing, a repetition of the same or another tithi takes place shortly after or before that sunrise; and when the equation for (*b*) is increasing an expunction of a tithi (different from the one in question) takes place shortly before or after it.

143. The identification of the date A.D. with the week-day arrived at by the above method, may be verified by Table XIII. The verification, however, is not in itself proof of the correctness of our results.

144. *To find the moment of the ending of a tithi.* Find the difference between the (*t*) on the given day at sunrise and the (*t*) of the tithi-index which shews the ending point of that tithi (Table VIII.). With this difference as argument find the corresponding time either in ghaṭikâs and palas, or hours and minutes, according to choice, from Table X. The given tithi ends after the given sunrise by the interval of time so found. But this interval is not always absolutely accurate. (*See Art. 82*). If accuracy is desired add the (*a*) (*b*) (*c*) for this interval of time (Table V.) to the (*a*) (*b*) (*c*) already obtained for sunrise. Add as before to (*a*) the equations of (*b*) and (*c*) from Tables VI. and VII., and find the difference between the (*t*) thus arrived at and the (*t*) of the ending point of the tithi (Table VIII.). The time corresponding to that difference, found from Table X., will show the ending of the tithi before or after the first found time. If still greater accuracy is desired, proceed until (*t*) amounts exactly to the (*t*) of the ending point (Table VIII.) For ordinary purposes, however, the first found time, or at least that arrived at after one more process, is sufficiently accurate.

145. The moment of the beginning of a tithi is the same as the moment of ending of the tithi next preceding it; and this can be found either by calculating backwards from the (*t*) of the same tithi, or independently from the (*t*) of the preceding tithi.

146. The moment of beginning or ending of tithis thus found is in mean time, and is applicable to all places on the meridian of Ujjain, which is the same as that of Lankâ. If the

[1] Thus far the process will give the correct result if there be no probability by the rule given below of the expunction (*kshaya*) or repetition (*vriddhi*) of a tithi shortly preceding or following; and the (*d*) and (*w*) arrived at at this stage will indicate by use of Table IX. the A.D. equivalent, and the week-day of the given tithi.

[2] For the definitions of expunged and repeated tithis see Art. 32 above.

exact mean time for other places is required, apply the correction given in Table XI., according to the rule given under that Table. If after this correction the ending time of a tithi is found to fall on the previous or following day the (*d*) and (*w*) should be altered accordingly.

Mean time is used throughout the parts of the Tables used for these rules, and it may sometimes differ from the true, used, at least in theory, in Hindu pañchâṅgs or almanacks.

The ending time of a tithi arrived at by these Tables may also somewhat differ from the ending time as arrived at from authorities other than the *Sûrya Siddhânta* which is used by us. The results, however, arrived at by the present Tables, may be safely relied on for all ordinary purposes.[1]

147. *N.B. i.* Up to 1100 A.D. both mean and true intercalary months are given in Table I. (*see Art.* 47 *above*). When it is not certain whether the given year is an expired or current year, whether it is a Chaitrâdi year or one of another kind, whether the given month is amânta or pûrṇimânta, and whether the intercalary month, if any, was taken true or mean, the only course is to try all possible years and months.

*N.B. ii.* The results are all Old Style dates up to, and New Style dates from, 1753 A.D. The New Style was introduced with effect from after 2nd September, 1752. Since only the initial dates of 1752 and 1753 are given, remember to apply the correction (+ 11 days) to any date between 2nd September, 1752, and 9th April, 1753, in calculating by the Hindu solar year, and between 2nd September, 1752, and 4th April, 1753, in calculating by the Hindu luni-solar year, so as to bring out the result in New Style dates A.D. The day of the week requires no alteration.

*N.B. iii.* If the date A.D. found above falls after February 28th in a leap-year, it must be reduced by 1.

*N.B. iv.* The Hindus generally use expired (*gata*) years, while *current* years are given throughout the Tables. For example, for Śaka year 1702 "expired" 1703 current is given.

148. EXAMPLE I. Required the week-day and the A.D. year, month, and day corresponding to Jyeshṭha śukla pañchamî (5th), year Sârvari, Śaka year 1702 expired (1703 current), and the ending and beginning time of that tithi.

The given year is Chaitrâdi (see N.B. ii., Table II., Part iii.). It does not matter whether the month is amânta or pûrṇimânta, because the fortnight belongs to Jyeshṭha by both systems (see Table II., Part i.). Looking to Table I. along the given current Śaka year 1703, we find that its initial day falls in A.D. 1780 (see note 1 to Art. 139), a leap-year, on the 5th April, Wednesday; and that *d* (col. 19), *w* (col. 20), *a* (col. 23), *b* (col. 24) and *c* (col. 25) are 96, 4, 1, 657 and 267 respectively. We write them in a horizontal line (see the working of the example below). From Table I., col. 8, we find that there is no added month in the year. The number therefore of tithis between Chaitra ś. 1 and Jyeshṭha ś. 5 was 64, viz., 60 up to the end of Vaiśâkha (see Table III., col. 3), the month preceding the given one, and 4 in Jyeshṭha. The sixtieth part of 64 (neglecting the fraction $\frac{4}{60}$ because it is not more than half) is 1. Reduce 64 by one and we have 63 as the approximate number of days between Chaitra ś. 1 and Jyeshṭha ś. 5. We write this number under (*d*). Turning to Table IV. with the argument 63 we find under (*w*) (*a*) (*b*) (*c*) the numbers 0, 1334, 286, 172, respectively, and we write them under their respective heads, and add together the two quantities under each head. With the argument (*b*) (943) we turn to Table VI. for the equation. We do not find exactly the number 943 given, but we have 940 and 950 and must see the difference between the corresponding equation-figures and fix the appropriate figure for 943. The auxiliary table given will fix this, but in practice it can be easily calculated in the head. (The

[1] See Arts. 36 and 37 in which all the points noted in this article are fully treated of.

full numbers are not given so as to avoid cumbrousness in the tables.) Thus the equation for (*b*) (943) is found to be 90, and from Table VII. the equation for (*c*) is found to be 38. Adding 90 and 38 to (*a*) (1335) we get 1463, which is the required tithi-index (*t*). Turning with this to Table VIII., col. 3. we find by col. 2 that the tithi current was sukla 5. *i.e.*, the given date. Then (*w*) 4, Wednesday, was its week-day; and the tithi was current at mean sunrise on the meridian of Ujjain on that week-day. Turning with (*d*) 159 to Table IX., we find that the equivalent date A.D. was 8th June; but as this was after 28th February in a leap-year, we fix 7th June, A.D. 1780, (see N.B. iii., Art. 147) as the equivalent of the given tithi. As (*t*) is not within 40 of 1667, the (*t*) of the 5th tithi (Table VIII.), there is no probability of an expunction or repetition shortly preceding or following (Art. 142). The answer therefore is Wednesday, June 7th, A.D. 1780.

*To find the ending time of the tithi.* (*t*) at sunrise is 1463; and Table VIII., col. 3, shews that the tithi will end when (*t*) amounts to 1667. (1667—1463 =) 204 = (Table X.) 14 hours, 27 minutes, and this process shews us that the tithi will end 14 hours, 27 minutes, after sunrise on Wednesday, June 7th. This time is, however, approximate. To find the time more accurately we add the increase in (*a*) (*b*) (*c*) for 14 h. 27 m. (Table V.) to the already calculated (*a*) (*b*) (*c*) at sunrise; and adding to (*a*) as before the equations of (*b*) and (*c*) (Tables VI. and VII.) we find that the resulting (*t*) amounts to 1686. 1686—1667 = 19 = 1 hour and 21 minutes (Table X.). But this is a period beyond the end of the tithi, and the amount must be deducted from the 14 h. 27 m. first found to get the true end. The true end then is 13 h. 6 m. after sunrise on June 7th. This time is accurate for ordinary purposes, but for still further accuracy we proceed again as before. We may either add the increase in (*a*) (*b*) (*c*) for 13 h. 6 m. to the value of (*a*) (*b*) (*c*) at sunrise, or subtract the increase of (*a*) (*b*) (*c*) for 1 h. 21 m. from their value at 14 h. 27 m. By either process we obtain (*t*) = 1665. Proceed again. 1667—1665 = 2 = (Table X.) 9 minutes after 13 h. 6 m. or 13 h. 15 m. Work through again for 13 h. 15 m. and we obtain (*t*) = 1668. Proceed again. 1668—1667 = 1 = (Table X.) 4 minutes before 13 h. 15 m. or 13 h. 11 m. Work for 13 h. 11 m., and we at last have 1667, the known ending point. It is thus proved that 13 h. 11 m. after sunrise is the absolutely accurate mean ending time of the tithi in question by the *Sûrya-Siddhânta*.

*To find the beginning time of the given tithi.* We may find this independently by calculating as before the (*t*) at sunrise for the preceding tithi, (in this case sukla 4th) and thence finding its ending time. But in the example given we calculate it from the (*t*) of the given tithi. The tithi begins when (*t*) amounts to 1333 (Table VIII.), or (1463—1333) 130 before sunrise on June 7th. 130 is (Table X.) 9 h. 13 m. Proceed as before, but deduct the (*a*) (*b*) (*c*) instead of adding, and (see working below) we eventually find that (*t*) amounts exactly to 1333 and therefore the tithi begins at 8 h. 26 m. before sunrise on June 7th, that is 15 h. 34 m. after sunrise on Tuesday the 6th. The beginning and ending times are by Ujjain or Lankâ mean time. If we want the time, for instance, for Benares the difference in longitude in time, 29 minutes, should be added to the above result (See Table XI.). This, however, does not affect the day.

It is often very necessary to know the moments of beginning and ending of a tithi. Thus our result brings out Wednesday, June 7th, but since the 5th tithi began 15 h. 34 m. after sunrise on Tuesday, *i.e.*, about 9 h. 34 m. p.m., it might well happen that an inscription might record a ceremony that took place at 10 p.m., and therefore fix the day as Tuesday the 5th tithi, which, unless the facts were known, would appear incorrect.

From Table XII. we find that 7th June, A.D. 1780, was a Wednesday, and this helps to fix that day as current.

We now give the working of EXAMPLE I.

WORKING OF EXAMPLE I.

| | d. | w. | a. | b. | c. |
|---|---|---|---|---|---|
| (*a*) *The day corresponding to Jyeshṭha śukla 5th.* Śaka 1703 current, Chaitra śukla 1st, (Table I., cols. 19, 20, 23, 24, 25) . . . . . | 96 | 4 | 1 | 657 | 267 |
| Approximate number of days from Chaitra śukla 1st to Jyeshṭha śuk. 5th, (64 tithis reduced by a 60th part, neglecting fractions, = 63) with its (*w*) (*a*) (*b*) (*c*) (Table IV.) . . . . . | 63 | 0 | 1334 | 286 | 172 |
| | 159 | 4 | 1335 | 943 | 439 |
| Equation for (*b*) (943) (Table VI.) . . . . . | | | 90 | | |
| Do. (*c*) (439) (Table VII.) . . . . . | | | 38 | | |
| | | | 1463 = *t*. | | |

(*t*) gives śukla 5th (Table VIII., cols. 2, 3) (the same as the given tithi).
(*d*)—1, (*N. B. iii.*, Art. 147), or the number of days elapsed from January 1st, = . . . . . 158

158 = June 7th (Table IX.). A.D. 1780 is the corresponding year, and 4 (*w*) Wednesday is the week-day of the given tithi.

*Answer.*—Wednesday, June 7th, 1780 A.D.

(*b*) *The ending of the tithi Jyeshṭha śuk.* 5. (Table VIII.) 1667—1463 = 204 = (14 h. 10 m. + 0 h. 17 m.) = 14 h. 27 m. (Table X.). Therefore the tithi ends at 14 h. 27 m. after mean sunrise on Wednesday. For more accurate time we proceed as follows:

| | a. | b. | c. |
|---|---|---|---|
| At sunrise on Wednesday (*see above*) . . . . . | 1335 | 943 | 439 |
| For 14 hours (Table V.) . . . . . | 198 | 21 | 2 |
| For 27 minutes, (Do.) . . . . . | 6 | 1 | 0 |
| | 1539 | 965 | 441 |
| Equation for (*b*) (965) (Table VI.) . . . . . | 109 | | |
| Do. (*c*) (441) (Do. VII.) . . . . . | 38 | | |
| | 1686 = *t*. | | |

1686—1667 (Table VIII.) = 19 = 1 h. 21 m.; and 1 h. 21 m. deducted from 14 h. 27 m. gives 13 h. 6 m. after sunrise on Wednesday as the moment when the tithi ended. This is sufficient for all practical purposes. For absolute accuracy we proceed again.

| | a. | b. | c. |
|---|---|---|---|
| For sunrise (*as before*) . . . . . | 1335 | 943 | 439 |
| For 13 hours (Table V.) . . . . . | 183 | 20 | 1 |
| For 6 minutes (Do.) . . . . . | 1 | 0 | 0 |
| | 1519 | 963 | 440 |
| Equation for (*b*) (963) (Table VI.) . . . . . | 108 | | |
| Do. (*c*) (440) (Do. VII.) . . . . . | 38 | | |
| | 1665 = *t*. | | |

1667—1665 = 2 = 9 m. after 13 h. 6 m. = 13 h. 15 h.

| | a. | b. | c. |
|---|---|---|---|
| Again for sunrise (*as before*) . . . . . . . . . . . . | 1335 | 943 | 439 |
| For 13 hours (Table V.) . . . . . . . . . . . . . . | 183 | 20 | 1 |
| For 15 minutes (Do.) . . . . . . . . . . . . . . . | 4 | 0 | 0 |
| | 1522 | 963 | 440 |
| Equation for (*b*) (963) . . . . . . . . . . . . . . | 108 | | |
| Do. (*c*) (440) . . . . . . . . . . . . . . . . | 38 | | |
| | 1668 = *t*. | | |

1668—1667 = 1 = 4 m. before 13 h. 15 m. = 13 h. 11 m.

| | | | |
|---|---|---|---|
| Again for sunrise (*as before*) . . . . . . . . . . . . | 1335 | 943 | 439 |
| For 13 hours (Table V.) . . . . . . . . . . . . . | 183 | 20 | 1 |
| For 11 minutes (Do.) . . . . . . . . . . . . . . . | 3 | 0 | 0 |
| | 1521 | 963 | 440 |
| Equation for (*b*) (963) . . . . . . . . . . . . . . | 108 | | |
| Do. (*c*) (440) . . . . . . . . . . . . . . . . | 38 | | |
| Actual end of the tithi . . . . . . . . . . . . . . | 1667 = *t*. | | |

Thus 13 h. 11 m. after sunrise is the absolutely accurate ending time of the tithi.

(*c*) *The beginning of the tithi, Jyeshṭha suk. 5.* Now for the beginning. 1463 (the original *t*. as found)—1333 (beginning of the tithi, (Table VIII.) = 130 = (Table X.) (7 h. 5 m. + 2 h. 8 m.) = 9 h. 13 m.; and we have this as the point of time before sunrise on Wednesday when the tithi begins.

| | a. | b. | c. | | a. | b. | c. |
|---|---|---|---|---|---|---|---|
| For sunrise (*as before*) . . . . . . . . . . . . . . | | | | | 1335 | 943 | 439 |
| For 9 h. (Table V.) . . . . . . . | 127 | 14 | 1 | | | | |
| For 13 m. (Do.) . . . . . . . . | 3 | 0 | 0 | | | | |
| Deduct . . . . . . . . . . . . | 130 | 14 | 1 | . . . . | 130 | 14 | 1 |
| | | | | | 1205 | 929 | 438 |
| Equation for *b*. (929) . . . . . . . . . . . . . . | | | | | 79 | | |
| Do. *c*. (438) . . . . . . . . . . . . . . . . | | | | | 37 | | |
| | | | | | 1321 = *t*. | | |

(The beginning of the tithi) 1333—1321 = 12 = Table X.) 51 m. after the above time (9 h. 13 m.), and this gives 8 h. 22 m. before sunrise. We proceed again.

| | a. | b. | c. |
|---|---|---|---|
| For 9 h. 13 m. before sunrise (*found above*) . . . . | 1205 | 929 | 438 |
| Plus for 51 minutes (Table V.) . . . . . . . . . . . | 12 | 1 | 0 |
| | 1217 | 930 | 438 |
| Equation for *b*. (930) . . . . . . . . . . . . . | 80 | | |
| Do. *c*. (438) . . . . . . . . . . . . . . . . | 37 | | |
| | 1334 = *t*. | | |

1334—1333 = 1 = 4 m. before the above time (viz., 8 h. 22 m.) *i.e.*, 8 h. 26 m. before sunrise. Proceed again.

| | *a.* | *b.* | *c.* |
|---|---|---|---|
| For 8 h. 22 m. before sunrise (*found above*) . . . . . | 1217 | 930 | 438 |
| Deduct for 4 m. (Table V.) . . . . . . . . . . . . | 1 | 0 | 0 |
| | 1216 | 930 | 438 |
| Equation for *b.* (930) . . . . . . . . . . . . . . | 80 | | |
| Do. *c.* (438) . . . . . . . . . . . . . . | 37 | | |
| | 1333 = *t.* | | |

The result is precisely the same as the beginning point of the tithi (Table VIII.), and we know that the tithi actually began 8 hours 26 minutes before sunrise on Wednesday, or at 15 h. 34 m. after sunrise on Tuesday, 6th June.

EXAMPLE II. Required the week-day and equivalent A.D. of Jyeshṭha śuk. dasamî (10th) of the southern Vikrama year 1836 expired, 1837 current. The given year is *not* Chaitrâdi. Referring to Table II., Parts ii., and iii., we find, by comparing the non-Chaitrâdi Vikrama year with the Śaka, that the corresponding Śaka year is 1703 current, that is the same as in the first example. We know that the months are amânta.

| | *d.* | *w.* | *a.* | *b.* | *c.* |
|---|---|---|---|---|---|
| State the figures for the initial day (Table I., cols. 19, 20, 23, 24, 25) | 96 | 4 | 1 | 657 | 267 |
| The number of intervened tithis down to end of Vaiśâkha, 60, (Table III.) + the number of the given date minus 1, is 69; reduced by a 60th part = 68, and by Table IV. we have . . . . . . | 68 | 5 | 3027 | 468 | 186 |
| | 164 | 2 | 3028 | 125 | 453 |
| Equation for (*b*) 125 (Table VI.) . . . . . . . . . . . . . . . | | | 239 | | |
| Do. (*c*) 453 (Table VII.) . . . . . . . . . . . . . . | | | 42 | | |
| | | | 3309 = *t.* | | |

(*d*) (164)—1 (*N. B. iii.*, Art. 147) = 163.

The result, 3309, fixes the day as sukla 10th (Table VIII., cols. 2, 3), the same as given.

*Answer.*—(By Table IX.) 163 = June 12th, 2 = Monday. The year is A.D. 1780 (Table II., Part ii.). The tithi will end at (3333—3309 = 24, or by Table X.) 1 h. 42 m. after sunrise, since 3309 represents the state of that tithi at sunrise, and it then had 24 lunation-parts to run. Note that this (*t*) (3309) is less by 24 than 3333, the ending point of the 10th tithi; that 24 is less than 40; and that the equation for (*b*) is increasing. This shows that an expunction of a tithi will shortly occur (*Art. 142.*)

EXAMPLE III. Required the week-day and equivalent A.D. of Jyeshṭha śukla ekâdaśî (11th) of the same Śaka year as in example 2, *i.e.*, Ś. 1703 current.

| | d. | w. | a. | b. | c. |
|---|---|---|---|---|---|
| See (Table I.) example 2 | 96 | 4 | 1 | 657 | 267 |
| Intervened days (to end of Vaiśâkha 59, + 11 given days—1) = 69. By Table IV. | 69 | 6 | 3366 | 504 | 189 |
| | 165 | 3 | 3367 | 161 | 456 |
| Equation for (b) (161) (Table VI.) | | | 258 | | |
| Do. (c) (456) (Table VII.) | | | 43 | | |
| | | | 3668 = t. | | |

This figure ($t$ = 3668) by Table VIII., cols. 2, 3, indicates śukla 12th.

$d$—1 (*N.B. iii.*, Art. 147) = 164 and Table IX. gives this as June 13th. The ($w$) is 3 = Tuesday. The year (Table II. Part iii.) is 1780 A.D.

The figure of ($t$), 3668, shows that the 12th tithi and not the required tithi (11th) was current at sunrise on Tuesday; but we found in example 2 that the 10th tithi was current at sunrise on Monday, June 12th, and we therefore learn that the 11th tithi was expunged. It commenced 1 h. 42 min. after sunrise on Monday and ended 4 minutes before sunrise on Tuesday, 13th June.[1] The corresponding day answering to śukla 10th is therefore Monday, June 12th, and that answering to śukla 12 is Tuesday the 13th June.

Example IV. Required the week-day and equivalent A.D. of the pûrṇimânta Âshâḍha kṛishṇa dvitîyâ (2) of the Northern Vikrama year 1837 expired, 1838 current. The northern Vikrama is a Chaitrâdi year, and so the year is the same as in the previous example, viz., A.D. 1780–1 (Table II., Part iii.). The corresponding amânta month is Jyeshṭha (Table II., Part i.). Work therefore for Jyeshṭha kṛishṇa 2nd in A.D. 1780–1 (Table I.).

| | d. | w. | a. | b. | c. |
|---|---|---|---|---|---|
| See example 1 (Table I.) | 96 | 4 | 1 | 657 | 267 |
| 60 (coll. dur. to end Vaiś.) + 15 (for kṛishṇa fortnight) + 1 (given date minus 1) = 76 tithis = 75 days (as before); Table IV. gives | 75 | 5 | 5397 | 722 | 205 |
| | 171 | 2 | 5398 | 379 | 472 |
| Equation for (b) (379) | | | 237 | | |
| Do. (c) (472) | | | 50 | | |
| | | | 5685 = t. | | |

($d$)—1 (*N.B. iii.*, Art. 147) = 170 = (Table IX.) 19th June. (2) = Monday. The year is 1780 A.D.

So far we have Monday, 19th June, A.D. 1780. But the figure 5685 for ($t$) shows that kṛi. 3rd and not the 2nd was current at sunrise on Monday the 19th June. It commenced (5685 – 5667 = 18 =) 1 h. 17 m. before sunrise on Monday. ($t$) being greater, but within 40, than the ending point of kṛi. 2nd, and the equation for ($b$) decreasing, it appears that a repetition of a tithi will shortly follow (but not precede). And thus we know that Sunday the 18th June is the equivalent of kṛi. 2nd.

Example V. Required the week-day and equivalent A.D. of the amânta Jyeshṭha kṛi. 3rd of the Śaka year 1703 current, the same as in the last 4 examples.

[1] This is shown by ($t$) = 3668 at sunrise, the end being indicated by 3667. Difference 1 lunation-unit, or 4 minutes.

| | *d.* | *w.* | *a.* | *b.* | *c.* |
|---|---|---|---|---|---|
| (See example 1) . . . . . . . . . . . . . . . . . . . . | 96 | 4 | 1 | 657 | 267 |
| 60 (coll. dur. to end Vaiś.) + 15 + 2 = 77 tithis = 76 days. (Table IV.) | 76 | 6 | 5736 | 758 | 208 |
| | 172 | 3 | 5737 | 415 | 475 |
| Equation for (*b*) (415) . . . . . . . . . . . . . . . . . . | | | 211 | | |
| Do. (*c*) (475) . . . . . . . . . . . . . . . . . . | | | 51 | | |
| | | | 5999 | | |

This indicates kṛishṇa 3rd, the same tithi as given. (*d*)—1 = 171 = 20th June, 1780 A.D.

From these last two examples we learn that kṛishṇa 3rd stands at sunrise on Tuesday 20th as well as Monday 19th. It is therefore a repeated or *vriddhi* tithi, and both days 19th and 20th correspond to it. It ends on Tuesday (6000—5999 = 1 =) 4 minutes after sunrise.

Example VI. Required the week-day and A.D. equivalent of Kârttika śukla 5th of the Northern Vikrama year 1833 expired (1834 current). (See example 2, page 70.)

The given year is Chaitrâdi. It matters not whether the month is amânta or pûrṇimânta because the given tithi is in the śukla fortnight. The initial day of the given year falls on (Table I., col. 19) 20th March (80), (col. 20) 4 Wednesday; and looking in Table I. along the line of the given year, we find in col. 8 that the month Bhâdrapada was intercalated or added *(adhika)* in it. So the number of months which intervened between the beginning of the year and the given tithi was 8, one more than in ordinary year.

| | *d.* | *w.* | *a.* | *b.* | *c.* |
|---|---|---|---|---|---|
| (Table I., cols. 19, 20, 23, 24, 25) . . . . . . . . . . . . . . | 80 | 4 | 9841 | 54 | 223 |
| (Coll. dur.) 240 + 4 = 244 = 240 days (Table IV.) . . . . . . . | 240 | 2 | 1272 | 710 | 657 |
| | 320 | 6 | 1113 | 764 | 880 |
| Equation for (*b*) (764) . . . . . . . . . . . . . . . . . . | | | 0 | | |
| Do. (*c*) (880) . . . . . . . . . . . . . . . . . . | | | 102 | | |
| | | | 1215 = *t*. | | |

This indicates, not kṛi. 5 as given, but kṛi. 4 (Table VIII.)

Adding 1 to (*d*) and (*w*) (see Rule above, Art. 139) . . . . . . 321 0

*a*—1 (*N.B. iii.*, Art. 147) 320 = (Table IX.) Nov. 16th. A.D. 1776. 0 = Saturday.

(*t*) being not within 40 of the ending point of the tithi there is no probability of a repetition or expunction shortly preceding or following, and therefore Saturday the 16th November, 1776 A.D., is the equivalent of the given tithi.

Example VII. Required the week-day and A.D. equivalent of amânta Mâgha kṛishṇa 1st of Kali 4923 expired, 4924 current. (See example 4, page 71.)

The given year is Chaitrâdi. Looking in Table I. along the line of the given year, we see that its initial day falls on 24th March (83), 1822 A.D., 1 Sunday, and that (col. 8) the month (7) Âśvina was intercalated and (10) Pausha expunged. So that, in counting, the number of intervened months is the same, viz., 10, as in an ordinary year, Mâgha coming after Pausha.

| | d. | w. | a. | b. | c. |
|---|---|---|---|---|---|
| (Table I., cols. 19, 20, 23, 24, 23) . . . . . . . . . . . . . | 83 | 1 | 212 | 899 | 229 |
| (Coll. dur.) 300 + 15 (sukla paksha) + (1—1=) 0 = 315 tithis = 310 days. By (Table IV.) . . . . . . . . . . . . . . . . . | 310 | 2 | 4976 | 250 | 849 |
| | 393 | 3 | 5188 | 149 | 78 |
| Equation for ($b$) (149) (Table VI.) . . . . . . . . . . . . . | | | 252 | | |
| Do. ($c$) (78) (Table VII.) . . . . . . . . . . . . . | | | 32 | | |
| | | | 5472 = $t$. | | |

The figure 5472 indicates (Table VIII.) kṛi. 2nd, *i.e.*, not the same as given (1st), but the tithi following. We therefore subtract 1 from ($d$) and ($w$) (Art. 139) making them 392 and 2.

Since ($t$) is not within 40 of the ending point of the tithi, there is no probability of a *kshaya* or *vṛiddhi* shortly following or preceding. ($w$) 2 = Monday. 392 = (Table IX.) 27th January. And therefore 27th January, A.D. 1823, Monday, is the equivalent of the given tithi.

EXAMPLE VIII. Required the week-day and the A.D. equivalent of śukla 13th of the Tuḷu month Puntelu, Kali year 4853 expired, 4854 current, "Angiras samvatsara" in the luni-solar or southern 60-year cycle. (See example 5, page 72.)

The initial day (Table I.) is Old Style 5th March (65), A.D. 1752, a leap-year, (5) Thursday; and Âshâḍha was intercalated. The Tuḷu month Puntelu corresponds to the Sanskṛit Pausha (Table II., Part ii.), ordinarily the 10th, but now the 11th, month on account of the intercalated Âshâḍha.

| | d. | w. | a. | b. | c. |
|---|---|---|---|---|---|
| (Table I., cols. 19, 20, 23, 24, 25) . . . . . . . . . . . . . | 65 | 5 | 39 | 777 | 213 |
| (Coll. dur.) 300 + 12 (given tithi minus 1) = 312 tithis = 307 days (Table IV.) . . . . . . . . . . . . . . . . . . . . . | 307 | 6 | 3960 | 142 | 840 |
| | 372 | 4 | 3999 | 919 | 53 |
| Equation for ($b$) (919) . . . . . . . . . . . . . . . . . . | | | 71 | | |
| Do. ($c$) (53) . . . . . . . . . . . . . . . . . . . . | | | 40 | | |
| | | | 4110 = $t$. | | |

The result, 4110, indicates śukla 13th, *i.e.*, the same tithi as that given.

($d$)—1 (*N.B. iii., Art. 147*) = 371 = (by Table IX.) January 6th, A.D. 1753.

We must add 11 days to this to make it a New Style date, because it falls after September 2nd, 1752, and before 4th April, 1753, the week-day remaining unaltered (*see N.B. ii., Art. 147*), and 17th January, 1753 A.D., is therefore the equivalent of the given date.

### (B.) *Conversion of Hindu solar dates into dates A.D.*

149. *To calculate the week-day and the equivalent date A.D.* Turn the given year into a Meshâdi Kali, Śaka, or Vikrama year, and the name of the given month into a sign-name, if they are not already given as such, and find the corresponding year A.D. by the aid of columns 1 to 5, Table I., and Table II., Parts ii., and iii. Looking in Table I. along the line of the Meshâdi year so obtained, write down in a horizontal line the following three quantities corresponding to the

commencement of that (Meshâdi) year, viz., (*d*) the date-indicator given in brackets after the day and month A.D. in col. 13, (*w*) the week-day number (*col. 14*), and the time—either in ghaṭikâs and palas, or in hours and minutes as desired—of the Mesha saṅkrânti according to the *Ârya-Siddhânta* (cols. 15, or 17). For a Bengali date falling between A.D. 1100 and 1900, take the time by the *Sûrya-Siddhânta* from cols. 15*a* or 17*a*. When the result is wanted for a place not on the meridian of Ujjain, apply to the Mesha saṅkrânti time the correction given in Table XI. Under these items write from Table III., cols. 6, 7, 8, or 9 as the case may be, the collective duration of time from the beginning of the year up to the end of the month preceding the given one—days under (*d*), week-day under (*w*), and hours and minutes or ghaṭikâs and palas under *h. m.*, or *gh. p.* respectively. Add together the three quantities. If the sum of hours exceeds 24, or if the sum of ghaṭikâs exceeds 60, write down the remainder only, and add one each to (*w*) and (*d*). If the sum of (*w*) exceeds 7, cast out sevens from it. The result is the time of the astronomical beginning of the current (given) month. Determine its civil beginning by the rules given in Art. 28 above.

When the month begins civilly on the same day as, on the day following, or on the third day after, the saṅkrânti day, subtract 1 from, or add 0, or 1, to both (*d*) and (*w*), and then to each of them add the number of the given day, casting out sevens from it in the case of (*w*). (*w*) is then the required week-day, and (*d*) will show, by Table IX., the A.D. equivalent of the given day.

*N.B. i.* When it is not certain whether the given year is Meshâdi or of another kind, or what rule for the civil beginning of the month applies, all possible ways must be tried.

*N.B. ii.* See *N.B. ii., iii., iv.*, Art. 147, under the rules for the conversion of luni-solar dates.

EXAMPLE IX. Required the week-day and the date A.D. corresponding to (Tamil) 18th Puraṭṭâsi of Rudhirodgârin, Kali year 4904 expired, (4905 current). (See example 7, p. 75.)

The given year, taken as a solar year, is Meshâdi. The month Puraṭṭâdi, or Puraṭṭâsi, corresponds to Kanyâ (Table II., Part ii.), and the year is a Tamil (Southern) one, to which the *Ârya Siddhânta* is applicable (*see Art. 21*). Looking in Table I. along the line of the given year, we find that it commenced on 11th April (col. 13), A.D. 1803, and we write as follows:—

| | d. | w. | h. | m. |
|---|---|---|---|---|
| (Table I., cols. 13, 14, 17) | 101 | 2 | 10 | 7 |
| (Table III., col. 7) collective duration up to the end of Siṁha | 156 | 2 | 10 | 28 |
| | 257 | 4 | 20 | 35 |
| This shows that the Kanyâ saṅkrânti took place on a (4) Wednesday, at 20 h. 35 m. after sunrise, or 2.35 a.m. on the European Thursday. (Always remember that the Hindu week-day begins at sunrise.) The month Kanyâ, therefore, begins civilly on Thursday.[1] (*Rule 2 (a), Art. 28.*) We add, therefore 0 to (*d*) and (*w*) | 0 | 0 | | |
| Add 18, the serial number of the given day, to (*d*) and, casting out sevens from the same figure, 18, add 4 to (*w*) | 18 | 4 | | |
| | 275 | 1 | | |

Then (*w*) = 1, *i.e.*, Sunday, and 275 = (Table IX.) 2nd October.

*Answer.*—Sunday, 2nd October, 1803 A.D.

EXAMPLE X. Required the week-day and A.D. date corresponding to the 20th day of the Bengali (solar) month Phâlguna of Śaka 1776 expired, 1777 current, at Calcutta.

1 It would have so begun if the saṅkrânti occurred at 7 p.m. on the Wednesday, or at any time after sunset (6 p.m.)

The year is Meshâdi and from Bengal, to which the *Sûrya Siddhânta* applies (*see Art. 21*). The Bengâli month Phâlguna corresponds to Kumbha (Table II., Part ii.). The year commenced on 11th April, 1854, A.D. (Table I.).

| | d. | w. | h. | m. |
|---|---|---|---|---|
| (Table I., cols. 13, 14, 17a) . . . . . . . . . . . . . | 101 | 3 | 17 | 13 |
| Difference of longitude for Calcutta (Table XI.) . . . . . . | | | | +50 |
| Collective duration up to the end of Makara (Table III., col. 9.) | 305 | 4 | 2 | 2 |
| | 406 | 0 | 20 | 5 |

This result represents the moment of the astronomical beginning of Kumbha, which is after midnight on Saturday, for 20 h. 5 m. after sunrise is 2.5 a.m. on the European Sunday morning. The month, therefore, begins civilly on Monday (Art. 28, *Rule 1 above*).

| | d. | w. |
|---|---|---|
| Add, therefore, 1 to (*d*) and (*w*) . . . . . . . . . . . | 1 | 1 |
| Add 20 (given day) to (*d*), and, casting out sevens from 20, add 6 to (*w*) . . . . . . . . . . . . . . . . . . . | 20 | 6 |
| 0 = Saturday, 427 = 3rd March (Table IX.) . . . . | 427 | 0 |

*Answer*.—Saturday, 3rd March, A.D. 1855.

EXAMPLE XI. Required the week-day and A.D. date corresponding to the Tinnevelly Âṇḍu 1024, 20th day of Âvaṇi. (See example 8, p. 73.)

The year is South Indian. It is not Meshâdi, but Siṁhâdi. Its corresponding Śaka year is 1771 current; and the sign-name of the month corresponding to Âvaṇi is Siṁha (Table I., and Table II., Parts ii., and iii.) The Śaka year 1771 commenced on 11th April (102), A.D. 1848 (a leap-year), on (3) Tuesday. Work by the *Ârya-Siddhânta* (*Art. 21*).

| | d. | w. | h. | m. |
|---|---|---|---|---|
| (Table I., cols. 13, 14, 17) . . . . . . . . . . . . . | 102 | 3 | 1 | 30 |
| Collective duration up to the end of Karka . . . . . . . | 125 | 6 | 9 | 38 |
| | 227 | 2 | 11 | 8 |

| | d. | w. |
|---|---|---|
| The month begins civilly on the same day by one of the South Indian systems (Art. 28, Rule 2, *a*); therefore subtract 1 from both (*d*) and (*w*). . . . . . . . . . . . . . . . . . . . . | 1 | 1 |
| | 226 | 1 |
| Add 20, the serial number of the given day, to (*d*) and (less sevens) to (*w*) . . . . . . . . . . . . . . . . . . . . | 20 | 6 |
| | 246 | 0 |
| Deduct 1 for 29th February (*N.B. ii.*, Art. 149 and *N.B. iii.*, Art. 147) | 1 | |
| | 245 | |

0 = Saturday. 245 = (Table IX.) Sept. 2nd.

*Answer.*—Saturday, September 2nd, 1848 A.D.

EXAMPLE XII. Required the week-day and A.D. date corresponding to the South Malayâḷam Âṇḍu 1024, 19th Chiṅgam. (The calculations in Example xi. shew that the South-Malayâḷam month Chiṅgam began civilly one day later (Art. 28, Rule 2*b*). Therefore the Tamil 20th Âvaṇi was the 19th South-Malayâḷam.)

Referring to Table II., Part ii., we see that the date is the same as in the last example.

EXAMPLE XIII. Required the week-day and A.D. date corresponding to the North Malayâḷam Âṇḍu 1023, 20th Chiṅgam.

Referring to Table II., Part ii., we see that the date is the same as in the last two examples.

(C.) *Conversion into dates A.D. of tithis which are coupled with solar months.*

150. Many inscriptions have been discovered containing dates, in expressing which a tithi has been coupled, not with a lunar, but with a solar month. We therefore find it necessary to give rules for the conversion of such dates.

Parts of two lunar months corresponding to each solar month are noted in Table II., Part ii., col. 14. Determine by Art. 119, or in doubtful cases by direct calculation made under Arts. 149 and 151, to which of these two months the given tithi of the given fortnight belongs, and then proceed according to the rules given in Art. 139.

It sometimes happens that the same solar month contains the given tithi of both the lunar months noted in Table II., Part ii., col. 14, one occurring at the beginning of it and the other at the end. Thus, suppose that in a certain year the solar month Mesha commenced on the luni-solar tithi Chaitra śukla ashṭami (8th) and ended on Vaiśâkha śukla daśamî (10th). In this case the tithi śukla navamî (9th) of both the lunar months Chaitra and Vaiśâkha fell in the same solar month Mesha. In such a case the exact corresponding lunar month cannot be determined unless the vâra (week-day), nakshatra, or yoga is given, as well as the tithi. If it is given, examine the date for both months, and after ascertaining when the given details agree with the given tithi, determine the date accordingly.

EXAMPLE XIV. Required the A.D. year, month, and day corresponding to a date given as follows;—"Śaka 1187, on the day of the nakshatra Rohiṇî, which fell on Saturday the thirteenth tithi of the second fortnight in the month of Mithuna."[1]

It is not stated whether the Śaka year is expired or current. We will therefore try it first as expired. The current year therefore is 1188. Turning to Table I. we find that its initial day, Chaitra śukla 1st, falls on 20th March (79), Friday (6), A.D. 1265. From Table II., Part ii., col. 14, we find that parts of the lunar months Jyeshṭha and Âshâḍha correspond to the solar month Mithuna. The Mesha saṅkrânti in that year falls on (Table I., col. 13) 25th March, Wednesday, that is on or about Chaitra śukla shashṭhî (6th), and therefore the Mithuna saṅkrânti falls on (about) Jyeshṭha śukla daśamî (10th) and the Karka saṅkrânti on (about) Âshâḍha śukla dvâdaśî (12th) (*see Art. 119*). Thus we see that the thirteenth tithi of the second fortnight falling in the solar month of Mithuna of the given date must belong to amânta Jyêshṭha.

[1] This date is from an actual inscription in Southern India. (See *Ind. Ant., XXII., p.* 219).

| | d. | w. | a. | b. | c. |
|---|---|---|---|---|---|
| S. 1188, Chaitra ś. 1st (Table I., cols. 19, 20, 23, 24, 25) . . . . | 79 | 6 | 287 | 879 | 265 |
| Approximate number of days from Ch. ś. 1st to Jyesh. kṛi. 13th (87 tithis reduced by 60th part = 86) with its (w) (a) (b) (c) (Table IV.) | 86 | 2 | 9122 | 121 | 235 |
| | 165 | 1 | 9409 | 0 | 500 |
| Equation for (b) (0) (Table VI.) . . . . . . . . . . . . . . | | | 140 | | |
| Do. (c) (500) Table VII.) . . . . . . . . . . . . . . . | | | 60 | | |
| | | | 9609 = t. | | |

The resulting number 9609 fixes the tithi as krishṇa 14th (Table VIII., cols. 2, 3), *i.e.*, the tithi immediately following the given tithi. There is no probability of a *kshaya* or *vriddhi* shortly before or after this (*Art 142*). Deduct, therefore, 1 from (d) and (w) . . . . . . 1 1

164 0

164 = (Table IX.) 13th June; 0 = Saturday.

*Answer.*—13th June, 1265 A.D., Saturday, (as required). [1]

## (D.) *Conversion of dates A.D.* [2] *into Hindu luni-solar dates.*

151. Given a year, month, and date A.D., write down in a horizontal line (w) the week-day number, and (a), (b), (c) (Table I., cols. 20, 23, 24, 25) of the initial day (Chaitra ś. 1) of the Hindu Chaitrâdi (Śaka) year corresponding to the given year; remembering that if the given date A.D. is earlier than such initial day, the (w) (a) (b) (c) of the previous Hindu year [3] must be taken. Subtract the date-indicator of the initial date (in brackets, Table I., col. 19) from the date number of the given date (Table IX.), remembering that, if the initial day of the previous Hindu year has been taken, the number to be taken from Table IX. is that on the right-hand side, and not that on the left (*see also N.B. ii. below*). The remainder is the number of days which have intervened between the beginning of the Hindu year and the required date. Write down, under their respective heads, the (w) (a) (b) (c) of the number of intervening days from Table IV., and add them together as before (*see rules for conversion of luni-solar dates into dates A.D.*). Add to (a) the equation for (b) and (c) (Tables VI., VII.) and the sum (t) will indicate the tithi (Table VIII.) at sunrise of the given day; (w) is its week-day. To the number of intervening days add its sixtieth [4] part. See the number of tithis next lower than this total [5] (Table III., col. 3) and the lunar month along the same line (col. 2). Then this month is the month preceding the required month, and the following month is the required month.

When there is an added month in the year, as shown along the line in col. 8 or 8a of Table I., if it comes prior to the resulting month, the month next preceding the resulting month

[1] It is found by actual calculation under Art. 156 that the given nakshatra falls on the same date, and therefore we know that the above result is correct.

[2] This problem is easier than its converse, the number of intervening days here being certain.

[3] If the Rule I(a) in Art. 104 (Table II., Part iii.) be applied, this latter part of the rule necessarily follows.

[4] A 59th part, or more properly 63rd, should be added, but by adding a 60th, which is more convenient, there will be no difference in the ultimate result. Neglect the fraction half or less, and take more than half as equivalent to one.

[5] This total is the approximate number of tithis which have intervened. When it is the same as, or very near to, the number of tithis forming the collective duration up to the end of a month (as given in col. 3, Table III.), there will be some doubt about the required month; but this difficulty will be easily solved by comparing together the resulting tithi and the number of tithis which have intervened.

is the required month; if the added month is the same as the resulting month, the date belongs to that added month itself; and if the resulting month comes earlier than the added month, the result is not affected.

When there is a suppressed month in the year, if it is the same as, or prior to, the resulting month, the month next following the resulting month is the required month. If it is subsequent to the resulting month the result is not affected. If the resulting month falls after both an added and suppressed month the result is unaffected.

From the date in a Chaitrâdi year thus found, any other Hindu year corresponding to it can be found, if required, by reference to Table II., Parts ii., and iii.

The tithi thus found is the tithi corresponding to the given date A.D.; but sometimes a tithi which is current at any moment of an A.D. date may be said to be its corresponding tithi.

*N.B. i.* See *N.B. ii.*, Art. 147; but for "+ 11" read "—11".

*N.B. ii.* If the given A.D. date falls in a leap-year after 29th February, or if its date-number is more than 365 (taken from the right-hand side of Table IX.) and the year next preceding it was a leap-year, add 1 to the date-number before subtracting the date-indicator from it.

Example xv. Required the tithi and month in the Śaka year corresponding to 7th June, 1780 A.D.

The Śaka year corresponding to the given date is 1703 current. Its initial day falls on (4) Wednesday, 5th April, the date-indicator being 96.

| | *w.* | *a.* | *b.* | *c.* |
|---|---|---|---|---|
| (Table I., cols. 20, 23, 24, 25) . . . . . . . . . . . . | 4 | 1 | 657 | 267 |
| 7th June = . . . . . 158 (Table IX.) | | | | |
| Add . . . . . . . + 1 for leap-year (*N.B. ii.*) | | | | |
| 159 | | | | |
| Deduct . . . . . . 96 the (*d*) of the initial date (Table I., col. 19). | | | | |
| Days that have intervened 63. By Table IV. 63 = . . . . | 0 | 1334 | 286 | 172 |
| | 4 | 1335 | 943 | 439 |
| Equation for (*b*) (943) (Table VI.) . . . . . . . . . | | 90 | | |
| Do. (*c*) (439) (Table VII.) . . . . . . . . . . | | 38 | | |
| | 4 | 1463 = *t*. | | |

Śukla 5th (Table VIII.) is the required tithi, and (4) Wednesday is the week-day. Now $63 + \frac{63}{60} = 64\frac{3}{60}$. The next lowest number in col. 3, Table III., is 60, which shows Vaiśâkha to be the preceding month. Jyeshṭha is therefore the required month.

*Answer.*—Saka 1703 current, Jyeshṭha śukla 5th, Wednesday.

If the exact beginning or ending time of the tithi is required, proceed as in example 1 above (*Art. 148.*)

We have seen in example 1 above (*Art. 148*) that this Jyeshṭha 5th ended, and śukla 6th commenced, at 13 h. 11 m. after sunrise on the given date; and after that hour śukla 6th corresponded with the given date. Śukla 6th therefore may be sometimes said to correspond to the given date as well as śukla 5th.

Example xvi.—Required the tithi and month in the southern Vikrama year corresponding to 12th September, 1776 A.D.

The Śaka year corresponding to the given date is 1699 current. Its initial date falls on 20th March (80), 4 Wednesday, A.D. 1776. Bhâdrapada was intercalated in that year.

| | *w.* | *a.* | *b.* | *c.* |
|---|---|---|---|---|
| (Table I., cols. 20, 23, 24, 25) | 4 | 9841 | 54 | 223 |
| 12 September = . . . . 255 (Table IX.) | | | | |
| Add . . . . . . . 1 for leap-year (*N.B. ii.*) | | | | |
| 256 | | | | |
| Deduct . . . . . . . 80 the (*d*) of the initial day. | | | | |
| Days that have intervened 176 = (Table IV.) | 1 | 9599 | 387 | 482 |
| | 5 | 9440 | 441 | 705 |
| Equation for (*b*) (441) (Table VI.) | | 191 | | |
| Do. (*c*) (705) (Table VII.) | | 118 | | |
| | 5 | 9749 = *t*. | | |

This indicates (Table VIII.) kṛishṇa 30th (amâvâsyâ, or new moon day), Thursday.

The intervening tithis are $176 + \frac{176}{60} = 179$. The number next below this in col. 3, Table III., is 150, and shows that Śrâvaṇa preceded the required month. But Bhâdrapada was intercalated this year and it immediately followed Śrâvaṇa. Therefore the resulting tithi belongs to the intercalated or adhika Bhâdrapada.

*Answer.*—Adhika Bhâdrapada kṛi: 30th of Śaka 1699 current, that is adhika Bhâdrapada kṛi. 30th of the Southern Vikrama Kârttikâdi year 1833 current, 1832 expired. (Table II., Part ii.).

EXAMPLE XVII. Required the Telugu and Tuḷu equivalents of December 1st, 1822 A.D.

The corresponding Telugu or Tuḷu Chaitrâdi Śaka year is 1745 current, Âsvina was intercalary and Pausha was expunged (col. 8, Table I.). Its initial date falls on 24 March (83), A.D. 1822, (1) Sunday.

| | *w.* | *a.* | *b.* | *c.* |
|---|---|---|---|---|
| Table I., cols. 20, 23, 24, 25) | 1 | 212 | 899 | 229 |
| 1st December = . . . . 335 (Table IX.) | | | | |
| Deduct . . . . . . . 83 (The *d.* of the initial day) | | | | |
| Days that have intervened 252 = (Table IV.) | 0 | 5335 | 145 | 690 |
| | 1 | 5547 | 44 | 919 |
| Equation for (*b*) (44) (Table IV.) | | 180 | | |
| Do. (*c*) (919) (Do. VII.) | | 90 | | |
| The results give us kṛishṇa 3, Sunday (1), (Table VIII.) | 1 | 5817 = *t*. | | |

$252 + \frac{252}{60} = 256$. The number next below 256 in col. 3, Table III., is 240, and shews that Kârttika preceded the required month, and the required month would therefore be Mârga-

śirsha. But Âśvina, which is prior to Mârgaśirsha, was intercalated. Kârttika therefore is the required month. Pausha was expunged, but being later than Kârttika the result is not affected.

*Answer.*—Sunday, Kârttika (Telugu), or Jârde (Tuḷu) (Table II., Part ii.), kṛ. 3rd of the year Chitrabhânu, Śaka 1745 (1744 expired), Kali year 4923 expired.

Example xviii. Required the tithi and pûrṇimânta month in the Śaka year corresponding to 18th January, 1541 A.D.

The given date is prior to Chaitra śukla 1 in the given year. We take therefore the initial day in the previous year, A.D. 1540, which falls on Tuesday the 9th March (69). The corresponding Śaka year is 1463 current.

| | | *w.* | *a.* | *b.* | *c.* |
|---|---|---|---|---|---|
| (Table I., cols. 20, 23, 24, 25) . . . . . . . . . . . | | 3 | 108 | 756 | 229 |
| 18th January = . . . | 383 (Table IX.) | | | | |
| Add for leap-year . . | 1 (*N.B. ii.*, latter part.) | | | | |
| | 384 | | | | |
| Deduct . . . . . . | 69 (The *d.* of the initial day.) | | | | |
| No. of intervening days . . | 315 = (by Table IV.) . . . . . | 0 | 6669 | 432 | 862 |
| | | 3 | 6777 | 188 | 91 |
| Equation for (*b*) (188) (Table VI.) . . . . . . . . . | | | 269 | | |
| Do. (*c*) (91) (Do. VII.) . . . . . . . . . . | | | 28 | | |
| | | 3 | 7074 = *t.* | | |

The result gives us kṛishṇa 7th, Tuesday (3) (Table VIII.).

$315 + \frac{315}{60} = 320$ tithis. The next lower number to 320 in col. 3, Table III., is 300, which shews Pausha as preceding the required month, and the required month would therefore be Mâgha. Âsvina, however, which is prior to Mâgha, was intercalary in this year; Pausha, therefore, would be the required month; but it was expunged; Mâgha, therefore, becomes again the required month. Adhika Âśvina and kshaya Pausha being both prior to Mâgha, they do not affect the result. By Table II. amânta Mâgha kṛishṇa is pûrṇimânta Phâlguna kṛishṇa. Therefore pûrṇimânta Phâlguna kṛishṇa 7th, Tuesday, Śaka 1463 current, is the required date.

### (E.) *Conversion of A.D. dates into Hindu solar dates.*

152. Given a year, month, and date A.D., write down from Table I. in a horizontal line the (*d*) (*w*) and (*h*) (*m*) (the time) of the Mesha saṅkrânti, by the *Ârya* or *Sûrya-Siddhânta* [1] as the case may require, of the Hindu Meshâdi year, remembering that if the given day A.D. is earlier than the Mesha saṅkranti day in that year the previous[2] Hindu year must be taken. Subtract the date-indicator of the Mesha saṅkrânti day from the date-number of the given date (Table IX.), remembering that if the Mesha saṅkrânti time of the previous Hindu year is taken the number to be taken from Table IX. is that on the right-hand side, and not that on the left (*see also Art. 151, N.B. ii.*); the remainder is the number of days which intervened between the Mesha saṅkrânti and the given day. Find from Table III., cols. 6, 7, 8 or 9, as the case may be, the number next below that number of intervening days. Write its three quantities (*d*), (*w*), and the time of the saṅkrânti (*h. m.*), under their respective heads, and add together the three quantities separately (*See Art. 149*

[1] See Art. 21, and notes 1 and 2, and Arts. 95 and 96.

[2] See note 4, p. 90.

*above*). The sum is the time of the astronomical beginning of the required month, and the month next following that given in col. 5, on the line of the next lowest number, is the month required.

Ascertain the day of the civil beginning of the current required month by the rules in Art. 28. When it falls on the same day as the saṅkrânti day, or the following, or the third day, respectively, subtract 1 from, or add 0 or 1 to, both (*d*) and (*w*). Subtract (*d*) from the date-number of the given date. The remainder is the required Hindu day. Add that remainder, casting out sevens from it, to (*w*). The sum is the week-day required.

From the Meshâdi year and the sign-name of the month thus found, any other corresponding Hindu year can be found by reference to Table III., Parts ii., and iii.

Observe the cautions contained in *N.B. i.* and *ii.* to Art. 151.

EXAMPLE XIX. Required the Tamil, Tinnevelly, and South and North Malayâḷam equivalents of 30th May, 1803 A.D. (See example 14, p. 76.)

The corresponding Meshâdi Śaka year current is 1726. Its Mesha saṅkrânti falls on April 11th (101), 2 Monday. The *Ârya Siddhânta* applies. (*See Art. 21.*)

| | *d.* | *w.* | *h.* | *m.* |
|---|---|---|---|---|
| (Table I., cols. 13 14, 17) . . . . . . . . . . . . . . | 101 | 2 | 10 | 7 |
| May 30th = . 150 (Table IX.) | | | | |
| Deduct . . . 101, the (*d*) of the initial day. | | | | |
| Intervening days 49 | | | | |
| The number next below 49, (Table III., col. 7), for the end of Mesha and beginning of Vṛishabha, is 30, and we have . . . . | 30 | 2 | 22 | 12 |
| [Total of hours = 32. 1 day of 24 hours carried over to (*d*) and (*w*).] Astronomical beginning of Vṛishabha . . . . . . . . . . | 132 | 5 | 8 | 19 |
| By all South Indian reckonings, except that in the South Malayâḷam country, the month begins civilly on the same day as the saṅkrânti. Subtract, therefore, 1 from (*d*) and (*w*) . . . . . . . | 1 | 1 | | |
| | 131 | 4 | | |
| Subtract 131 (*d*) from the number of the given date . . . | 150 | | | |
| Remainder, 19, is the required date in the month of Vṛishabha. | 19 | | | |
| Add 19, casting out sevens, to (*w*) . . . . . . . . . | | 5 | | |
| Required week-day . . . . . . . . . . . . . . . . . | | 2 | | |

*Answer.*—Monday, 19th day of the month Vṛishabha, Tamil Vaigâśi, of Śaka 1726 current (1725 expired); Kali 4904 expired (Table I., or Table II., Part iii.); Tinnevelly Âṇḍu 978, Vaigâśi 19th; North Malayâḷam Âṇḍu 978, Eḍavam 19th.

The Vṛishabha saṅkrânti took place 8 h. 19 m. after sunrise, viz., not within the first $\frac{3}{5}$ths of the day. Therefore by the South Malayâḷam system the month Vṛishabha began civilly, not on (5) Thursday, but on the following day (6) Friday. Therefore we have to add or subtract nothing from 132 and 5. Subtracting 132 from 150, the remainder, 18th, is the required day. Adding (18 + 7) to 5 (*w*) we get (2) Monday as the required week-day. Therefore Monday 18th of Eḍavam, Kollam Âṇḍu 978, is the required South Malayâḷam equivalent.

EXAMPLE XX. Required the week-day and Bengali date at Calcutta corresponding to March 3rd, 1855 A.D. The *Sûrya-Siddhânta* is the authority in Bengal. The given day is earlier than the Mesha saṅkrânti in the year given. We must take therefore as our starting-point the Mesha saṅkrânti of the previous year, which falls on 11th April (101), Tuesday, (3) Śaka 1777 current, A.D. 1854.

| | | d. | w. | h. | m. |
|---|---|---|---|---|---|
| (Table I., cols. 13, 14, 17a) | | 101 | 3 | 17 | 13 |
| Difference of longitude for Calcutta (Table XI.) | | | | | + 50 |
| March 3rd, 1855 = | 427 (Table IX.) | | | | |
| Deduct (*d*) of the initial day | 101 | | | | |
| Intervening days | 326 | | | | |
| The number next below 326 (Table III. col. 9), for the end of Makara and beginning of Kumbha is | | 305 | 4 | 2 | 2 |
| The astronomical beginning of Kumbha, after midnight on Saturday = | | 406 | 0 | 20 | 5 |
| The civil beginning falls on the third day, Monday (Art. 28). We add therefore 1 to (*d*) and (*w*) | | 1 | 1 | | |
| The last civil day of Makara = | | 407 | 1 | | |
| Subtract (*d*) 407 from the date number of 3rd March | | 427 | | | |
| Remainder 20, and the required date is 20th Kumbha. | | 20 | | | |
| Add 20 to (*w*) casting out sevens | | | 6 | | |
| The required week-day is Saturday | | | 0 | | |

The Bengali month corresponding to Kumbha is Phâlguna (Table II., Part ii.).
*Answer.*—The 20th day of Phâlguna, Saturday, Saka, 1776 expired. (See example x above.)

EXAMPLE XXI. Required the South Indian solar dates equivalent to 2nd September, 1848 A.D.

The corresponding Meshâdi Śaka year (current) is 1771. It commenced on 11th April (102), Tuesday (3).

| | | d. | w. | h. | m. |
|---|---|---|---|---|---|
| (Table I., cols. 13, 14, 17) | | 102 | 3 | 1 | 30 |
| 2nd September = | 245 (Table IX.) | | | | |
| Add 1 for leap-year | 1 (*N.B. ii*, Art. 151.) | | | | |
| Date-number of the given day | 246 | | | | |
| Deduct (*d*) of the initial day | 102 | | | | |
| Intervening days | 144 | | | | |
| The number next below 144, (col. 7, Table III.), for the end of Karka and beginning of Siṁha is 125, and we write | | 125 | 6 | 9 | 38 |
| The astronomical beginning of Siṁha is | | 227 | 2 | 11 | 8 |

This is the civil beginning by one of the Southern systems.

| | d. | w. | h. | m. |
|---|---|---|---|---|
| (*Brought over*) . . . | 277 | 2 | 11 | 8 |
| Subtract 1 from (*d*) and (*w*) . . . . . . . . . . . . . . . | 1 | 1 | | |
| Last civil day of Karka = . . . . . . . . . . . . | 226 | 1 | | |
| Subtract 226 from the date number 246 (Table IX.) of the given day . . . . . . . . . . . . . . . . . . . | 246 | | | |
| Required date in the month Siṁha . . . . . . . . . . . | 20 | | | |
| Add this to (*w*) casting out sevens . . . . . . . . . . . | | 6 | | |
| The required week-day is Saturday . . . . . . . . . . . | | 0 | | |

The equivalents are therefore:—(see Table II., Part ii.)

| | | | | | |
|---|---|---|---|---|---|
| Saturday | 19th | Chiṅgam, | South Malayâlam Âṇḍu | 1024 | (See example XII., p. 89.) |
| Do. | 20th | Do. | North Do. | 1023 | |
| Do. | 20th | Avaṇi | Tinnevelly Âṇḍu | 1024 | |
| Do. | 20th | Do. | Tamil Śaka year | 1771 | (current). |

### (F.) *Determination of Karaṇas.*

153. We now proceed to give rules for finding the karaṇas on a given day,—the exact moments of their beginning and ending, and the karaṇa current at sunrise on any given day, or at any moment of any given day.

The karaṇas[1] of a given tithi may be found by the following rule. Multiply the number of expired tithis by two. Divide this by 7; and the remainder is the karaṇa for the current half of the tithi. *Example.*—Find the karaṇa for the second half of kṛishṇa 8th. The number of expired tithis from the beginning of the month is ($15 + 7\frac{1}{2} =$) $22\frac{1}{2}$. $22\frac{1}{2} \times 2 = 45$. Casting out sevens the 3rd, or Kaulava, is the required karaṇa.

154. To find the exact moments on which the karaṇas corresponding to a given tithi begin and end. Find the duration of the tithi from its beginning and ending moments, as calculated by the method given in Arts. 139, 144, and 145 above. The first half of the tithi is the period of duration of its first karaṇa, and the second half that of the second.

EXAMPLE XXII. Find the karaṇas, and the periods of their duration, current on Jyeshṭha śukla pañchamî (5th) of the Śaka year 1702 expired (1703 current). From Table VIII., cols. 4 and 5 we observe that (1) Bava is the first, and (2) Bâlava is the second, karaṇa corresponding to the 5th tithi. In the first example above (*Art. 145*) we have found that the tithi commenced on Tuesday, 6th June, A.D. 1780, at 15 h. 34 m. after mean sunrise, and that it ended on Wednesday, 7th June, at 13 h. 11 m. after mean sunrise. It lasted therefore for 21 h. 37 m. (8 h. 26 m. on Tuesday and 13 h. 11 m. on Wednesday). Half of this duration is 10 h. 48 m. The Bava karaṇa lasted therefore from 15 h. 34 m. after mean sunrise on Tuesday, June 6th, to 2 h. 22 m. after mean sunrise on Wednesday, June 7th, and the Bâlava karaṇa lasted thence to the end of the tithi.

155. The karaṇa at sunrise or at any other time can of course easily be found by the above method. It can also be calculated independently by finding the (*t*) for the time given. Its beginning or ending time also can be found, with its index, by the same method as is used for that of a tithi. The index of a karaṇa can be easily found from that of a tithi by finding the middle point of the latter. For example, the index of the middle point of śukla 14th

[1] For the definition of karaṇas, and other information regarding them, see Arts. 10 and 40.

is 4500, or 4333 + half the difference between 4333 and 4667 (*Table VIII.*), and therefore the indices for the beginning and ending of the 5th karaṇa on śukla 14th are 4333 and 4500, and of the 6th karaṇa on the same tithi 4500 and 4667.

EXAMPLE XXII(*a*). Find the karaṇa at sunrise on Wednesday the 7th June, A.D. 1780, Jyeshṭha śukla 5th, Śaka 1702 expired (1703 current).

In examples i. and xv. above we have found (*t*) at the given sunrise to be 1463. Turning with this to Table VIII. we see that the karaṇa was the 1st or 2nd. The index of the first is 1333 to 1500, and therefore the first karaṇa, Bava, was current at the given sunrise.

### (G) *Determination of Nakshatras.*

156. *To find the nakshatra at sunrise, or at any other moment, of an Indian or European date.* If the given date be other than a tithi or a European date, turn it into one or other of these. Find the (*a*) (*b*) (*c*) and (*t*) for the given moment by the method given in Arts. 139, 148 or 151. (*Examples i. or xv.*) above. Multiply (*c*) by ten; add 7207 to the product, and from this sum subtract the equation for (*c*) (Table VII.). Call the remainder (*s*). Add (*s*) to (*t*). Call the result (*n*). Taken as an index, (*n*) shows, by Table VIII., col. 6, 7, 8, the nakshatra current at the given moment as calculated by the ordinary system.

157. If the nakshatra according to the Garga or Brahma Siddhânta system is required, use cols. 9 or 10 respectively of Table VIII.

158. The beginning or ending time of the nakshatra can be calculated in the same manner as that of a tithi. Since (*c*) is expressed in 1000ths, and 10000ths of it are neglected, the time will not be absolutely correct.

EXAMPLE XXIII. Find the nakshatra current at sunrise on Wednesday, Jyeshṭha śukla 5th, Śaka 1702 expired, (7th June, 1780 A.D.)

| | *t.* | *c.* | *Equation for c.* (Table VII.) |
|---|---|---|---|
| As calculated in Example i. or xv. above | 1463 | 439 | 38 |
| Multiply (*c*) by 10 | | 439 × 10 = 4390 | |
| Add | | 7207 | |
| | | 1597 | |
| Subtract equation for (*c*) | | 38 | |
| Add (*s*) to (*t*) | 1559 | 1559 = (*s*) | |
| | 3022 = (*n*) | | |

This result (*n*) gives Aśleshâ (Table VIII., cols. 6, 7, 8) as the required current nakshatra.

The (*n*) so found 3022—2963 (index to beginning point of Aśleshâ) = 59. Therefore Aśleshâ begins 3 h. 52 m. (Table X., col. 4) before sunrise on the Wednesday.

3333 (end of Aśleshâ)—3022(*n*) = 311, and therefore Aśleshâ ends (19 h. 40 m. + 43 m. =) 20 h. 23 m. after sunrise on the Wednesday.

For greater accuracy we may proceed as in Example 1 (*Art. 148.*)

### (H.) *Determination of Yogas.*

159. *The next problem is to find the yoga* at sunrise or at any other moment of an Indian or European date. If the given date is other than a tithi or a European date, turn it

into one or the other of these. Find (*a*) (*b*) (*c*) (*l*) (*s*) and (*n*) for the given moment as above (*Art. 156*). Add (*s*) to (*n*). Call the sum (*y*). This, as index, shews by Table VIII., cols. 11, 12, 13, the yoga current at the given moment.

EXAMPLE XXIV. Find the yoga at sunrise on Jyeshṭha śukla 5th, Saka 1702 expired, 7th June, 1780 A.D.

As calculated in example xviii. $(s) = 1559$ $(n) = 3022$
Add (*n*) to (*s*) . . . . . . . $(n) = 3022$

Required yoga $(y) =$ . . . 4581 = (13) Vyâghâta (Table VIII.).

We find the beginning point of Vyâghâta from this.

The (*y*) so found 4581—4444 (beginning point of Vyâghâta) = 137 = (6 h. 6 m. + 2 h. 15 m. =) 8 h. 21 m. before sunrise on Wednesday (Table X., col. 5).

The end of Vyâghâta is found thus:

(End of Vyâghâta) 4815—4581 (*y*) = 234 = (12 h. 12 m. + 2 h. 4 m. =) 14 h. 16 m. after sunrise on Wednesday.

## (l.) *Verification of Indian dates.*

160. (*See Art. 132.*) The following is an example of the facility afforded by the Tables in this volume for verifying Indian dates.

EXAMPLE XXV. Suppose an inscription to contain the following record of its date,— "Śaka 666, Kârttika krishṇa amâvâsyâ (30), Sunday, nakshatra Hasta." The problem is to verify this date and find its equivalent A.D. There is nothing here to shew whether the given year is current or expired, whether the given month is amânta or pûrṇimânta, and whether, if the year be the current one, the intercalary month in it was taken as true or mean.[1]

First let us suppose that the year is an expired one (667 current) and the month amânta. There was no intercalary month in that year. The given month would therefore be the eighth, and the number of intervening months from the beginning of the year is 7.

| | *d.* | *w.* | *a.* | *b.* | *c.* |
|---|---|---|---|---|---|
| Saka 667 current. (Table I., cols. 19, 20, 23, 24, 25) . . . . | 80 | 6 | 324 | 773 | 278 |
| 210 (7 months) + 15 (śukla) + 14 (kr. amâvâsyâ is 15, and 1 must be substracted by rule) = 239 tithis = 235 days . . . . . . . | 235 | 4 | 9578 | 529 | 643 |
| | 315 | 3 | 9902 | 302 | 921 |
| Equation for (*b*) (302) (Table VI.) . . . . . . . . . . . . | | | 271 | | |
| Do. (*c*) (921) (Do. VII.) . . . . . . . . . . . . | | | 90 | | |
| | | 3 | 263 = *t*. | | |

This gives us Tuesday, sukla 1st (Table VIII.). Index, $t = 263$, proves that 263 parts of the tithi had expired at sunrise on Tuesday, and thence we learn that this sukla 1st commenced on Monday, and that the preceding tithi kṛi. 30 would possibly commence on Sunday. If so, can we connect the tithi kṛi. 30 with the Sunday? Let us see.

1 This will illustrate the danger of trusting to Tables XIV. and XV. in important cases.

| | d. | w. | a. | b. | c. |
|---|---|---|---|---|---|
| Already obtained | 315 | 3 | 9902 | 302 | 921 |
| Subtract value for two days (Table IV.) | 2 | 2 | 677 | 73 | 5 |
| | 313 | 1 | 9225 | 229 | 916 |
| Equation for (*b*) (229) (Table VI.) | | | 279 | | |
| Do. (*c*) (916) (Do. VII.) | | | 91 | | |
| | | 1 | 9595 = *t*. | | |

This index gives us kṛishṇa 14th (Table VIII.) as current at sunrise on Sunday (*1*). The tithi ended and kṛi. 30 commenced (9667 − 9595 = 72 =) 5 h. 6 m. after sunrise on Sunday. This kṛi. 30 therefore can be connected with a Sunday, and if the nakshatra comes right—Hasta—then this would be the given date. We calculate the nakshatra at sunrise on Sunday.

| | t. | c. | |
|---|---|---|---|
| As calculated above | 9595 | 916 | |
| (*c*) multiplied by 10 | | 916 × 10 = | 9160 |
| Add constant | | | 7207 |
| | | | 6367 |
| Subtract the equation for (*c*) (Table VII.) | | | 91 |
| Add (*s*) to (*t*) | 6276 | | 6276 = (*s*) |
| | 5871 = (*n*) | | |

This index (*n*) gives nakshatra No. 16 Visâkhâ (Table VIII., col. 6, 7, 8). Therefore No. 13 Hasta had already passed, and this proves that the date obtained above is incorrect.

Now if Kârttika in the given record be pûrṇimânta, the amânta month corresponding (Table II., Part i) would be Âśvina, the 7th month, and it is possible that Âśvina kṛi. 30, falling back as it does 29 or 30 days from the date calculated, might fall on a Sunday. Let us see if it did so.

| | d. | w. | a. | b. | c. |
|---|---|---|---|---|---|
| Chaitra śukla 1, Śaka 667 current (*as above*) | 80 | 6 | 324 | 773 | 278 |
| 180 (6 expired months) + 15 (śukla) + 14 (*see above*) = 209 tithis = 206 days | 206 | 3 | 9758 | 476 | 564 |
| | 286 | 2 | 82 | 249 | 842 |
| Equation for (*b*) (249) (Table VI.) | | | 280 | | |
| Do. (*c*) (842) (Do. VII.) | | | 111 | | |
| | | 2 | 473 = (*t*) | | |

The result gives us Monday, śukla 2nd. [1]

[1] Note that this approximate calculation, which is the same as that by method B, comes out actually wrong by two days.

| | d. | w. | a. | b. | c. |
|---|---|---|---|---|---|
| State the figures for this . . . . . . . . . . . . . . . . | 286 | 2 | 82 | 249 | 842 |
| Subtract value for two days (Table IV.) . . . . . . . . . . | 2 | 2 | 677 | 73 | 5 |
| | 284 | 0 | 9405 | 176 | 837 |
| Equation for (*b*) (176) (Table VI.) . . . . . . . . . . . . | | | 265 | | |
| Do. (*c*) (842) (Do. VII.) . . . . . . . . . . . . | | | 112 | | |
| | | 0 | 9782 | | |

This gives Saturday krishṇa (30), amâvâsyâ, *i.e.*, that tithi had (10,000 − 9782) 218 parts to run at sunrise on Saturday. Therefore it ended on Saturday, and cannot be connected with a Sunday. Here again we have not the correct date.

Now let us suppose that the given year 666 is a *current* amânta year. Then the given month, Kârttika, is amânta, and the intercalary month was Bhâdrapada. The given month would be the 9th.

| | d. | w. | a. | b. | c. |
|---|---|---|---|---|---|
| Chaitra śukla 1st, Śaka 666 current (Table I.) . . . . . . . . . | 61 | 0 | 289 | 837 | 227 |
| 240 (for 8 months) + 15 (śukla) + 14 (*as above*) = 269 tithies = 265 days (Table IV.) . . . . . . . . . . . . . . . . | 265 | 6 | 9737 | 617 | 726 |
| | 326 | 6 | 26 | 454 | 953 |
| Equation for (*b*) (454) (Table VI.) . . . . . . . . . . . . | | | 180 | | |
| Do (*c*) (953) (Do. VII.) . . . . . . . . . . . . | | | 78 | | |
| | | 6 | 284 = (*t*) | | |

This gives us Friday, śukla 1st. The preceding day is krishṇa amâvâsyâ, and this therefore ends on Thursday and can in no way be connected with a Sunday. This date is therefore again wrong. The amâvâsyâ of the previous month (29 days back) would end on a Wednesday or perhaps Tuesday, so that cannot help us. If we go back yet a month more, it is possible that the krishṇa amâvâsyâ might fall on a Sunday. That month could only be called Kârttika if it were treated according to the pûrṇimânta system and if there were no intercalary month. The given month would then be the 7th in the year. We test this as usual.

| | d. | w. | a. | b. | c. |
|---|---|---|---|---|---|
| Chaitra śukla 1st, Śaka 666 current . . . . . . . . . . . . | 61 | 0 | 289 | 837 | 227 |
| 180 (6 expired months) + 15 śukla + 14 (*as before*) = 209 tithis = 206 days (Table IV.) . . . . . . . . . . . . . . . . . . | 206 | 3 | 9758 | 476 | 564 |
| | 267 | 3 | 47 | 313 | 791 |
| Equation for (*b*) (313) (Table VI.) . . . . . . . . . . . . | | | 269 | | |
| Do. (*c*) (791) (Do. VII.) . . . . . . . . . . . . | | | 119 | | |
| | | 3 | 435 = *t*. | | |

This gives Tuesday,[1] śukla 2nd, two tithis in advance of the required one.

[1] In this case the results by the approximate method A or B will be wrong by two days.

We may either subtract the value of (*w*) (*a*) (*b*) (*c*) for two days from their value as already obtained, or may add the value for (206—2 =) 204 days to the value at the beginning of the year. We try the latter.

| | *d.* | *w.* | *a.* | *b.* | *c.* |
|---|---|---|---|---|---|
| Chaitra sukla 1st, Śaka 666 current (Table I.) . . . . . . . | 61 | 0 | 289 | 837 | 227 |
| 204 days (Table IV.) . . . . . . . . . . . . . . . . . | 204 | 1 | 9081 | 403 | 559 |
| | 265 | 1 | 9370 | 240 | 786 |
| Equation for (*b*) (240) (Table VI.) . . . . . . . . . . . . | | | 280 | | |
| Do. (*c*) (786) (Do. VII.) . . . . . . . . . . . . . | | | 119 | | |
| | | 1 | 9769 = *t*. | | |

This gives us kṛishṇa amâvâsyâ, (1) Sunday, as required.

(*d*) = 265 = (Table IX.) 22nd September, 743 A.D. (Table I.). From Table XIII. we see that the week-day is right. If the nakshatra Hasta comes right, then this is the given date. We calculate it according to rule.

| | *t.* | *c.* |
|---|---|---|
| As already obtained . . . . . . . . . . | 9769 | 786 |
| (*c*) multiplied by 10 . . . . . . . . . | | 7860 |
| Add constant . . . . . . . . . . . . | | 7207 |
| | | 5067 |
| Subtract the equation for (*c*) (786) (Table VII.) | | 119 |
| Add (*s*) to (*t*) . . . . . . . . . . . | 4948 | 4948 = (*s*) |
| | 4717 = (*n*) | |

This result gives No. 13 Hasta (Table VIII.) as required.

This therefore is the given date. Its equivalent A.D. is 22nd September, 743 A.D. The data were imaginary. If they had been taken from an actual record they would have proved that mean and not true intercalary months were in use in A.D. 743, because we have found that there was no intercalary month prior to the given month Kârttika. The mean intercalary month in that year (Table I.) was the 9th month, Mârgaśirsha, and of course Kârttika was unaffected by it.

160(*A*). See page of Addenda and Errata.

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## *PART V.*

## THE MUHAMMADAN CALENDAR.

161. The Muhammadan era of the *Hijra*, or "flight," dates from the flight of Muhammad (Anglice Mahomet) which took place, according to the Hissabi or astronomical reckoning, on the evening of July 15th, A.D. 622. But in the *Helali*, or chronological reckoning, Friday, July 16th, is made the initial date. The era was introduced by the Khalif Umar.

162. The year is purely lunar, and the month begins with the first heliacal rising of the moon after the new moon. The year is one of 354 days, and of 355 in intercalary years. The months have alternately 30 and 29 days each (*but see below*), with an extra day added to the last month eleven times in a cycle of thirty years. These are usually taken as the 2nd, 5th, 7th, 10th, 13th, 15th, 18th, 21st, 24th, 26th, and 29th in the cycle, but Jervis gives the 8th, 16th, 19th, and 27th as intercalary instead of the 7th, 15th, 18th and 26th, though he mentions the usual list. Ulug Beg mentions the 16th as a leap-year. It may be taken as certain that the practice varies in different countries, and sometimes even at different periods in the same country.

30 years are equal to ($354 \times 30 + 11 =$) 10,631 days and the mean length of the year is $354\frac{11}{30}$ days.[1]

Since each Hijra year begins 10 or 11 civil days earlier than the last, in the course of 33 years the beginning of the Muhammadan year runs through the whole course of the seasons.

163. Table XVI. gives a complete list of the initial dates of the Muhammadan Hijra years from A.D. 300 to A.D. 1900. The asterisk in col. 1 shews the leap-years, when the year consists of 355 days, an extra day being added to the last month Zi'l-ḥijjat. The numbers in brackets following the date in col. 3 refer to Table IX. (*see above, Art. 95*), and are for purposes of calculation as shewn below.

**Muhammadan Months.**

| | | Days | Collective duration. | | | Days. | Collective duration. |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| 1 | Muḥarram . . . . . . . . . | 30 | 30 | 7 | Rajab . . . . . . . | 30 | 207 |
| 2 | Safar . . . . . . . . . . | 29 | 59 | 8 | Sha'bân . . . . . . | 29 | 236 |
| 3 | Rabî-ul awwal . . . . . . | 30 | 89 | 9 | Ramazân . . . . . | 30 | 266 |
| 4 | Rabî-ul âkhir, or Rabi-uś śânî. | 29 | 118 | 10 | Shawwâl . . . . . | 29 | 295 |
| 5 | Jumâda'l awwal . . . . . . . | 30 | 148 | 11 | Zi-l-ka'da . . . . . | 30 | 325 |
| 6 | Jumâda'l âkhir, or Jumâda-ś śânî | 29 | 177 | 12 | Zi-l-ḥijja . . . . . | 29 | 354 |
| | | | | | *In leap-years* . . . | 30 | 355 |

164. Since the Muhammadan year invariably begins with the heliacal rising of the moon, or her first observed appearance on the western horizon shortly after the sunset following the new-moon (the amâvâsyâ day of the Hindu luni-solar calendar), it follows that this rising is due about the end of the first tithi (sukla pratipadâ) of every lunar month, and that she is actually seen on the evening of the civil day corresponding to the 1st or 2nd tithi of the sukla (bright) fortnight. As, however, the Muhammadan day—contrary to Hindu practice, which counts the day from sunrise to sunrise—consists of the period from sunset to sunset, the first date of a Muhammadan month is always entered in Hindu almanacks as corresponding with the next following Hindu civil day. For instance, if the heliacal rising of the moon takes place shortly after sunset on a Saturday, the 1st day of the Muhammadan month is, in Hindu pañchângs, coupled with the

[1] A year of the Hijra = 0.970223 of a Gregorian year, and a Gregorian year = 1.03069 years of the Hijra. Thus 32 Gregorian years are about equal to 33 years of the Hijra, or more nearly 163 Gregorian years are within less than a day of 168 Hijra years.

Sunday which begins at the next sunrise. But the Muhammadan day and the first day of the Muhammadan month begin with the Saturday sunset. (*See Art. 30, and the pañchâng extract attached.*)

165. It will be well to note that where the first tithi of a month ends not less than 5 ghaṭikâs, about two hours, before sunset, the heliacal rising of the moon will most probably take place on the same evening; but where the first tithi ends 5 ghaṭikâs or more after sunset the heliacal rising will probably not take place till the following evening. When the first tithi ends within these two periods, *i.e.*, 5 ghaṭikâs before or after sunset, the day of the heliacal rising can only be ascertained by elaborate calculations. In the pañchâng extract appended to Art. 30 it is noted that the heliacal rising of the moon takes place on the day corresponding to September 1st.

166. It must also be specially noted that variation of latitude and longitude sometimes causes a difference in the number of days in a month; for since the beginning of the Muhammadan month depends on the heliacal rising of the moon, the month may begin a day earlier at one place than at another, and therefore the following month may contain in one case a day more than in the other. Hence it is not right to lay down a law for all places in the world where Muhammadan reckoning is used, asserting that invariably months have alternately 29 and 30 days. The month Safar, for instance, is said to have 29 days, but in the pañchâng extract given above (*Art. 30*) it has 30 days. No universal rule can be made, therefore, and each case can only be a matter of calculation.[1] The rule may be accepted as fairly accurate.

167. The days of the week are named as in the following Table.

**Days of the Week.**

| | *Hindustâni.* | *Persian.* | *Arabic.* | *Hindi.* |
|---|---|---|---|---|
| 1. Sun. | Itwâr. | Yak-shamba. | Yaumu'l-aḥad. | Rabi-bâr. |
| 2. Mon. | Somwâr, or Pîr. | Do-shamba. | „ -iśnain. | Som-bâr. |
| 3. Tues. | Mangal. | Sih-shamba. | „ -śalâsa'. | Mangal-bâr. |
| 4. Wed. | Budh. | Chahâr-shamba. | „ -arbâ'. | Budh-bâr. |
| 5. Thurs. | Jum'a-rât. | Panj-shamba. | „ -khamîs. | Brihaspati-bâr. |
| 6. Fri. | Jum'a. | Âdîna. | „ -Jum'ah. | Śukra-bâr. |
| 7. Sat. | Sanichar. | Shamba, or Hafta. | Yaumu's-sab't. | Sani-bâr. |

## *Old and New style.*

168. The New Style was introduced into all the Roman Catholic countries in Europe from October 5th, 1582 A.D., the year 1600 remaining a leap-year, while it was ordained that 1700, 1800, and 1900 should be common and not leap-years. This was not introduced into England till September 3rd, A.D. 1752. In the Table of Muhammadan initial dates we have given the comparative dates according to English computation, and if it is desired to assimilate the date to that of any Catholic country, 10 days must be added to the initial dates given by us from Hijra 991 to Hijra 1111 inclusive, and 11 days from H. 1112 to 1165 inclusive. Thus, for Catholic countries H. 1002 must be taken as beginning on September 27th, A.D. 1593.

[1] So far as I know no European chronologist of the present century has noticed this point. Tables could be constructed for the heliacal rising of the moon in every month of every year, but it would be too great a work for the present publication. [S. B. D.]

The Catholic dates will be found in Professor R. Wustenfeld's "*Vergleichungs-Tabellen der Muhammadanischen und Christlichen Zeitrechnung*" (*Leipsic* 1854).

*To convert a date A.H. into a date A.D.*

169. Rule 1. Given a Muhammadan year, month, and date. Take down (*w*) the week-day number of the initial day of the given year from Table XVI., col. 2, and (*d*) the date-indicator in brackets given in col. 3 of the same Table (*Art. 163 and 95 above*.) Add to each the collective duration up to the end of the month preceding the one given, as also the moment of the given date minus 1 (*Table in Art. 163 above*). Of the two totals the first gives the day of the week by casting out sevens, and the second gives the day of the month with reference to Table IX.

Rule 2. Where the day indicated by the second total falls on or after February 29th in an English leap-year, reduce the total by one day.

Rule 3. For Old and New Style between Hijra 991 and 1165 see the preceding article.

Example 1. Required the English equivalent of 20th Muharram, A.H. 1260.
A.H. 1260 begins (Table XVI.) January 22nd, 1844.

| | (*w*) *Col.* 2 | (*d*) *Col.* 3 |
|---|---|---|
| | 2 | 22 |
| Given date minus 1 = | 19 | 19 |
| | 21 | 41 = (Table IX.) Feb. 10th. |
| Cast out sevens = | 21 | |
| | 0 = Saturday. | |

*Answer.*—Saturday, February 10th, A.D. 1844.

Example 2. Required the English equivalent of 9th Rajab, A.H. 1311.
A.H. 1311 begins July 15th, 1893.

| | *w.* | *d.* |
|---|---|---|
| | 0 | 196 |
| 9th Rajab = (177 + 8) = | 185 | 185 |
| | 7 \| 185 | 381 = Jan. 16th, 1894. |
| | (26) 3 = Tuesday. | |

*Answer.*—Tuesday, January 16th, A.D. 1894.

This last example has been designedly introduced to prove the point we have insisted on viz., that care must be exercised in dealing with Muhammadan dates. According to Traill's *Indian Diary, Comparative Table of Dates*, giving the correspondence of English, Bengali, N.W. Fasali, "Samvat", Muhammadan, and Burmese dates, Rajab 1st corresponded with January 9th, and therefore Rajab 9th was Wednesday, January 17th, but Letts and Whitaker give Rajab 1st as corresponding with January 8th, and therefore Rajab 9th = Tuesday, January 16th, as by our Tables.

*To convert a date A.D. into a date A.H.*

170. Rule 1. Take down ($w$) the week-day number of the initial day of the corresponding Muhammadan year, or the year previous if the given date falls before its initial date, from Table XVI., col. 2, and ($d$) the corresponding date-indicator in brackets as given in col. 3. Subtract ($d$) from the collective duration up to the given A.D. date, as given in Table IX., Parts i. or ii. as the case may be. Add the remainder to ($w$). From the same remainder subtract the collective duration given in the Table in Art. 163 above which is next lowest, and add 1. Of these two totals ($w$) gives, by casting out sevens, the day of the week, and ($d$) the date of the Muhammadan month following that whose collective duration was taken.

Rule 2. When the given English date is in a leap-year, and falls on or after February 29th, or when its date-number is more than 365 (taken from the right-hand side of Table IX.), and the year preceding it was a leap-year, add 1 to the collective duration given in Table IX.

Rule 3. For Old and New Style see above, Art. 167.

EXAMPLE. Required the Muhammadan equivalent of January 16th, 894 A.D.

Since by Table XVI. we see that A.H. 1312 began July 5th, 1894 A.D., it is clear that we must take the figures of the previous year. This gives us the following:

| | | |
|---|---|---|
| ($w$) | | ($d$) |
| 0 | | 196 |
| | Jan. 16th (Table IX.) | = 381 |
| | | − 196 |
| 185 | . . . . . . . . . . . . . | 185 |
| 7 \| 185 | | |
| (26) 3 = Tuesday. | Coll. dur. (Art. 163) | − 177 |
| | | 8 |
| | | + 1 |
| | | 9 |

*Answer.*—Tuesday, Rajab 9th, A.H. 1311.

*Perpetual Muhammadan Calendar.*

By the kindness of Dr. J. Burgess we are able to publish the following perpetual Muhammadan Calendar, which is very simple and may be found of use. Where the week-day is known this Calendar gives a choice of four or five days in the month. But where it is not known it must be found, and in that case our own process will be the simpler, besides fixing the day exactly instead of merely giving a choice of several days.

## PERPETUAL MUHAMMADAN CALENDAR.

| | | | | | | | Years A.H. | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 0 | 30 | 60 | 90 | 120 | 150 | 180 |
| | | | | | | | 210 | 240 | 270 | 300 | 330 | 360 | 390 |
| | | | | | | | 420 | 450 | 480 | 510 | 540 | 570 | 600 |
| | | | | | | | 630 | 660 | 690 | 720 | 750 | 780 | 810 |
| | | | | | | | 840 | 870 | 900 | 930 | 960 | 990 | 1020 |
| | | | | | | | 1050 | 1080 | 1110 | 1140 | 1170 | 1200 | 1230 |
| | | | | | | | 1260 | 1290 | 1320 | 1350 | 1380 | 1410 | 1440 |
| For odd years | | | | | | | Dominical Letters | | | | | | |
| 0 | 5* | 8 | 13* | | 21* | 29* | G | B | D | F | A | C | E |
| 1 | | 9 | | 17 | | 25 | C | E | G | B | D | F | A |
| 2* | | 10* | | 18* | | 26* | F | A | C | E | G | B | D |
| 3 | | 11 | 16* | 19 | 24* | 27 | A | C | E | G | B | D | F |
| 4 | | 12 | | 20 | | 28 | D | F | A | C | E | G | B |
| | 6 | | 14 | | 22 | | B | D | F | A | C | E | G |
| | 7* | | 15 | | 23 | | E | G | B | D | F | A | C |
| 1 Muharram<br>10 Shawwâl | | | | | | | A | G | F | E | D | C | B |
| 2 Ṣafar<br>7 Rajab | | | | | | | C | B | A | G | F | E | D |
| 3 Rabi'l-âwwal<br>12 Zi'l-ḥijjat | | | | | | | D | C | B | A | G | F | E |
| 4 Rabi'l-âkhir<br>9 Ramaḍan | | | | | | | F | E | D | C | B | A | G |
| 5 Jamâdu-l-âwwal | | | | | | | G | F | E | D | C | B | A |
| 6 Jamâdu-l-âkhir<br>11 Zi'l-ka'dat | | | | | | | B | A | G | F | E | D | C |
| 8 Sha'bân | | | | | | | E | D | C | B | A | G | F |
| 1 | 8 | 15 | 22 | 29 | | | Sun. | Mon. | Tues. | Wed. | Thur. | Fri. | Sat. |
| 2 | 9 | 16 | 23 | 30 | | | Mon. | Tues. | Wed. | Thur. | Fri. | Sat. | Sun. |
| 3 | 10 | 17 | 24 | | | | Tues. | Wed. | Thur. | Fri. | Sat. | Sun. | Mon. |
| 4 | 11 | 18 | 25 | | | | Wed. | Thur. | Fri. | Sat. | Sun. | Mon. | Tues. |
| 5 | 12 | 19 | 26 | | | | Thur. | Fri. | Sat. | Sun. | Mon. | Tues. | Wed. |
| 6 | 13 | 20 | 27 | | | | Fri. | Sat. | Sun. | Mon. | Tues. | Wed. | Thur. |
| 7 | 14 | 21 | 28 | | | | Sat. | Sun. | Mon. | Tues. | Wed. | Thur. | Fri. |

From the Hijra date subtract the next greatest at the head of the first Table, and in that column find the Dominical letter corresponding to the remainder. In the second Table, with the Dominical letter opposite the given month, run down to the week-days, and on the left will be found the dates and vice versa.

Example. For Ramaḍan, A.H. 1310. The nearest year above is 1290, difference 20; in the same column with 1290, and in line with 20, is F. In line with Ramaḍan and the column F we find Sunday 1st, 8th, 15th, 22nd, 29th, etc.

* In the 11 years marked with an asterisk the month Zi'l-ka'dat has 30 days, in all others 29. Thus A.H. 1306 (1290 + 16) had 355 days, the 30th of Zi'l-ka'dat being Sunday.

# TABLES.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | Samvatsara | | II. ADDED LUNAR MONTHS. True. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kali | Saka | Chaitrâdi Vikrama | Meshâdi (Solar) year in Bengal | Kollam | A. D. | (Southern) | Brihaspati cycle (Northern) current at Mesha saṅkrânti | Name of month | Time of the preceding saṅkrânti expressed in: Lunation-parts (t.) | Time of the preceding saṅkrânti expressed in: Tithis | Time of the succeeding saṅkrânti expressed in: Lunation-parts (t.) | Time of the succeeding saṅkrânti expressed in: Tithis |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 3402 | 223 | 358 | — | — | *300- 1 | 47 Pramâdin | | | | | | |
| 3403 | 224 | 359 | — | — | 301- 2 | 48 Ânanda | | 7 Âśvina | 9950 | 29.850 | 287 | 0.861 |
| 3404 | 225 | 360 | — | — | 302- 3 | 49 Râkshasa | | | | | | |
| 3405 | 226 | 361 | — | — | 303- 4 | 50 Anala | | | | | | |
| 3406 | 227 | 362 | — | — | *304- 5 | 51 Pingala | | 5 Śrâvana | 9585 | 28.755 | 248 | 0.744 |
| 3407 | 228 | 363 | — | — | 305- 6 | 52 Kâlayukta | | | | | | |
| 3408 | 229 | 364 | — | — | 306- 7 | 53 Siddhârthin | | | | | | |
| 3409 | 230 | 365 | — | — | 307- 8 | 54 Raudra | | 3 Jyeshtha | 9442 | 28.326 | 152 | 0.456 |
| 3410 | 231 | 366 | — | — | *308- 9 | 55 Durmati | | | | | | |
| 3411 | 232 | 367 | — | — | 309-10 | 56 Dundubhi | | | | | | |
| 3412 | 233 | 368 | — | — | 310-11 | 57 Rudhirodgârin | | 2 Vaiśâkha | 9781 | 29.343 | 321 | 0.963 |
| 3413 | 234 | 369 | — | — | 311-12 | 58 Raktâksha [1] | | | | | | |
| 3414 | 235 | 370 | — | — | *312-13 | 60 Kshaya | | 6 Bhâdrapada | 9767 | 29.301 | 374 | 1.122 |
| 3415 | 236 | 371 | — | — | 313-14 | 1 Prabhava | | | | | | |
| 3416 | 237 | 372 | — | — | 314-15 | 2 Vibhava | | | | | | |
| 3417 | 238 | 373 | — | — | 315-16 | 3 Sukla | | 4 Âshâḍha | 9648 | 28.944 | 306 | 0.918 |
| 3418 | 239 | 374 | — | — | *316-17 | 4 Pramoda | | | | | | |
| 3419 | 240 | 375 | — | — | 317-18 | 5 Prajâpati | | | | | | |
| 3420 | 241 | 376 | — | — | 318-19 | 6 Angiras | | 3 Jyeshtha | 9861 | 29.583 | 348 | 1.044 |
| 3421 | 242 | 377 | — | — | 319-20 | 7 Śrîmukha | | | | | | |
| 3422 | 243 | 378 | — | — | *320-21 | 8 Bhâva | | 7 Âśvina | 9919 | 29.757 | 312 | 0.936 |
| 3423 | 244 | 379 | — | — | 321-22 | 9 Yuvan | | | | | | |
| 3424 | 245 | 380 | — | — | 322-23 | 10 Dhâtri | | | | | | |
| 3425 | 246 | 381 | — | — | 323-24 | 11 Îśvara | | 5 Śrâvana | 9770 | 29.310 | 349 | 1.047 |
| 3426 | 247 | 382 | — | — | *324-25 | 12 Bahudhânya | | | | | | |
| 3427 | 248 | 383 | — | — | 325-26 | 13 Pramâthin | | | | | | |
| 3428 | 249 | 384 | — | — | 326-27 | 14 Vikrama | | 3 Jyeshtha | 9409 | 28.227 | 186 | 0.558 |
| 3429 | 250 | 385 | — | — | 327-28 | 15 Vrisha | | | | | | |
| 3430 | 251 | 386 | — | — | *328-29 | 16 Chitrabhânu | | | | | | |
| 3431 | 252 | 387 | — | — | 329-30 | 17 Subhânu | | 2 Vaiśâkha | 9897 | 29.691 | 348 | 1.044 |
| 3432 | 253 | 388 | — | — | 330-31 | 18 Târana | | | | | | |
| 3433 | 254 | 389 | — | — | 331-32 | 19 Pârthiva | | 6 Bhâdrapada | 9835 | 29.505 | 360 | 1.080 |
| 3434 | 255 | 390 | — | — | *332-33 | 20 Vyaya | | | | | | |

[1] Krodhana, No. 59, was suppressed.

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

| II. ADDED LUNAR MONTHS (*continued.*) | | | | | III. COMMENCEMENT OF THE | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean | | | | | Solar year. | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | |
| Name of month. | Time of the preceding saṅkrânti expressed in | | Time of the succeeding saṅkrânti expressed in | | Day and Month A. D. | (Time of the Mesha saṅkrânti.) | | | | | Day and Month A. D. | Week day | At Sunrise on meridian of Ujjain. | | | | | Kali |
| | | | | | | Week day. | By the Ârya Siddhânta. | | | | | | Moon's Age | | | | | |
| | Lunation parts. (*t*.) | Tithis. | Lunation parts. (*t*.) | Tithis. | | | Gh. | Pa. | H. | M. | | | Lunat. parts elapsed. (*t*.) | Tithis elapsed. | *a* | *b* | *c* | |
| 8a | 9a | 10a | 11a | 12a | 13 | 14 | 15 | | 17 | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| | | | | | 16 Mar. (76) | 0 Sat. | 37 | 30 | 15 | 0 | 8 Mar. (68) | 6 Fri. | 34 | 102 | 9981 | 895 | 256 | 3402 |
| 10 Pausha | 9980 | 29.940 | 287 | 0.862 | 16 Mar. (75) | 1 Sun. | 53 | 1 | 21 | 12 | 26 Feb. (57) | 4 Wed. | 199 | 597 | 196 | 779 | 228 | 3403 |
| | | | | | 17 Mar. (76) | 3 Tues. | 8 | 32 | 3 | 25 | 17 Mar. (76) | 3 Tues. | 235 | 705 | 230 | 715 | 279 | 3404 |
| | | | | | 17 Mar. (76) | 4 Wed. | 24 | 4 | 9 | 37 | 6 Mar. (65) | 0 Sat. | 192 | 576 | 106 | 569 | 248 | 3405 |
| 6 Bhâdrapada. | 9815 | 29.446 | 123 | 0.368 | 16 Mar. (76) | 5 Thur. | 39 | 35 | 15 | 50 | 23 Feb. (54) | 4 Wed. | 199 | 597 | 9962 | 409 | 218 | 3406 |
| | | | | | 16 Mar. (75) | 6 Fri. | 55 | 6 | 22 | 2 | 13 Mar. (72) | 3 Tues. | 272 | 816 | 16 | 345 | 269 | 3407 |
| | | | | | 17 Mar. (76) | 1 Sun. | 10 | 37 | 4 | 15 | 2 Mar. (61) | 0 Sat. | 163 | 489 | 9892 | 192 | 238 | 3408 |
| 3 Jyeshtha | 9958 | 29.874 | 265 | 0.796 | 17 Mar. (76) | 2 Mon. | 26 | 9 | 10 | 27 | 20 Feb. (51) | 5 Thur. | 314 | 942 | 107 | 76 | 210 | 3409 |
| | | | | | 16 Mar. (75) | 3 Tues. | 41 | 40 | 16 | 40 | 10 Mar. (70) | 4 Wed. | 292 | 876 | 141 | 12 | 261 | 3410 |
| 11 Mâgha | 9793 | 29.380 | 101 | 0.302 | 16 Mar. (75) | 4 Wed. | 57 | 11 | 22 | 52 | 27 Feb. (58) | 1 Sun. | 49 | 147 | 17 | 859 | 233 | 3411 |
| | | | | | 17 Mar. (76) | 6 Fri. | 12 | 42 | 5 | 5 | 17 Feb. (48) | 6 Fri. | 234 | 702 | 231 | 749 | 202 | 3412 |
| | | | | | 17 Mar. (76) | 0 Sat. | 28 | 14 | 11 | 17 | 8 Mar. (67) | 5 Thur. | 282 | 846 | 266 | 678 | 254 | 3413 |
| 8 Kârttika | 9936 | 29.809 | 244 | 0.731 | 16 Mar. (76) | 1 Sun. | 43 | 45 | 17 | 30 | 25 Feb. (56) | 2 Mon. | 260 | 780 | 142 | 526 | 223 | 3414 |
| | | | | | 16 Mar. (75) | 2 Mon. | 59 | 16 | 23 | 42 | 14 Mar. (73) | 0 Sat. | 42 | 126 | 9836 | 425 | 271 | 3415 |
| | | | | | 17 Mar. (76) | 4 Wed. | 14 | 47 | 5 | 55 | 4 Mar. (63) | 5 Thur. | 322 | 966 | 52 | 300 | 243 | 3416 |
| 4 Âshâḍha | 9772 | 29.315 | 79 | 0.237 | 17 Mar. (76) | 5 Thur. | 30 | 19 | 12 | 7 | 21 Feb. (52) | 2 Mon. | 186 | 558 | 9928 | 156 | 213 | 3417 |
| | | | | | 16 Mar. (76) | 6 Fri. | 45 | 50 | 18 | 20 | 11 Mar. (71) | 1 Sun. | 179 | 537 | 9962 | 92 | 264 | 3418 |
| | | | | | 17 Mar. (76) | 1 Sun. | 1 | 21 | 0 | 32 | 1 Mar. (60) | 6 Fri. | 296 | 888 | 177 | 970 | 236 | 3419 |
| 1 Chaitra | 9914 | 29.743 | 222 | 0.665 | 17 Mar. (76) | 2 Mon. | 16 | 52 | 6 | 45 | 18 Feb. (49) | 3 Tues. | 69 | 207 | 52 | 823 | 205 | 3420 |
| | | | | | 17 Mar. (76) | 3 Tues. | 32 | 24 | 12 | 57 | 9 Mar. (68) | 2 Mon. | 87 | 261 | 87 | 759 | 256 | 3421 |
| 9 Mârgaśîrsha | 9750 | 29.249 | 57 | 0.171 | 16 Mar. (76) | 4 Wed. | 47 | 55 | 19 | 10 | 26 Feb. (57) | 6 Fri. | 17 | 051 | 9963 | 606 | 225 | 3422 |
| | | | | | 17 Mar. (76) | 6 Fri. | 3 | 26 | 1 | 22 | 16 Mar. (75) | 5 Thur. | 101 | 303 | 9997 | 542 | 277 | 3423 |
| | | | | | 17 Mar. (76) | 0 Sat. | 18 | 57 | 7 | 35 | 5 Mar. (64) | 2 Mon. | 104 | 312 | 9873 | 389 | 246 | 3424 |
| 6 Bhâdrapada. | 9893 | 29.678 | 200 | 0.600 | 17 Mar. (76) | 1 Sun. | 34 | 29 | 13 | 47 | 22 Feb. (53) | 6 Fri. | 31 | 093 | 9749 | 236 | 215 | 3425 |
| | | | | | 16 Mar. (76) | 2 Mon. | 50 | 0 | 20 | 0 | 12 Mar. (72) | 5 Thur. | 47 | 141 | 9783 | 172 | 266 | 3426 |
| | | | | | 17 Mar. (76) | 4 Wed. | 5 | 31 | 2 | 12 | 2 Mar. (61) | 3 Tues. | 187 | 561 | 9998 | 56 | 236 | 3427 |
| 2 Vaiśâkha. | 9728 | 29.184 | 35 | 0.106 | 17 Mar. (76) | 5 Thur. | 21 | 2 | 8 | 25 | 20 Feb. (51) | 1 Sun. | 302 | 906 | 212 | 939 | 210 | 3428 |
| | | | | | 17 Mar. (76) | 6 Fri. | 36 | 34 | 14 | 37 | 11 Mar. (70) | 0 Sat. | 288 | 864 | 247 | 875 | 261 | 3429 |
| 11 Mâgha. | 9871 | 29.612 | 178 | 0.534 | 16 Mar. (76) | 0 Sat. | 52 | 5 | 20 | 50 | 28 Feb. (59) | 4 Wed. | 124 | 372 | 123 | 723 | 231 | 3430 |
| | | | | | 17 Mar. (76) | 2 Mon. | 7 | 36 | 3 | 2 | 16 Feb. (47) | 1 Sun. | 81 | 243 | 9998 | 570 | 200 | 3431 |
| | | | | | 17 Mar. (76) | 3 Tues. | 23 | 7 | 9 | 15 | 7 Mar. (66) | 0 Sat. | 268 | 804 | 33 | 506 | 251 | 3432 |
| 7 Âśvina | 9706 | 29.118 | 13 | 0.040 | 17 Mar. (76) | 4 Wed. | 38 | 39 | 15 | 27 | 24 Feb. (55) | 4 Wed. | 161 | 483 | 9908 | 353 | 220 | 3433 |
| | | | | | 16 Mar. (76) | 5 Thur. | 54 | 10 | 21 | 40 | 14 Mar. (74) | 3 Tues. | 219 | 657 | 9943 | 289 | 272 | 3434 |

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| Kali. | Saka. | Chaitrâdi. Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | (Southern.) | Brihaspati cycle (Northern) current at Mesha sankrânti. | Name of month. | Time of the preceding sankrânti expressed in Lunation-parts (*t*.) | Time of the preceding sankrânti expressed in Tithis. | Time of the succeeding sankrânti expressed in Lunation-parts (*t*.) | Time of the succeeding sankrânti expressed in Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 3435 | 256 | 391 | — | — | 333-34 | 21 Sarvajit | | | | | | |
| 3436 | 257 | 392 | — | — | 334-35 | 22 Sarvadhârin | | 4 Âshâḍha | 9718 | 29.154 | 474 | 1.422 |
| 3437 | 258 | 393 | — | — | 335-36 | 23 Virodhin | | | | | | |
| 3438 | 259 | 394 | — | — | *336-37 | 24 Vikṛita | | | | | | |
| 3439 | 260 | 395 | — | — | 337-38 | 25 Khara | | 3 Jyeshṭha | 9861 | 29.583 | 607 | 1.821 |
| 3440 | 261 | 396 | — | — | 338-39 | 26 Nandana | | | | | | |
| 3441 | 262 | 397 | — | — | 339-40 | 27 Vijaya | | 7 Âśvina | 9888 | 29.664 | 275 | 0.825 |
| 3442 | 263 | 398 | — | — | *340-41 | 28 Jaya | | | | | | |
| 3443 | 264 | 399 | — | — | 341-42 | 29 Manmatha | | | | | | |
| 3444 | 265 | 400 | — | — | 342-43 | 30 Durmukha | | 5 Śrâvaṇa | 9957 | 29.871 | 532 | 1.596 |
| 3445 | 266 | 401 | — | — | 343-44 | 31 Hemalamba | | | | | | |
| 3446 | 267 | 402 | — | — | *344-45 | 32 Vilamba | | | | | | |
| 3447 | 268 | 403 | — | — | 345-46 | 33 Vikârin | | 3 Jyeshṭha | 9384 | 28.152 | 152 | 0.456 |
| 3448 | 269 | 404 | — | — | 346-47 | 34 Śârvari | | | | | | |
| 3449 | 270 | 405 | — | — | 347-48 | 35 Plava | | | | | | |
| 3450 | 271 | 406 | — | — | *348-49 | 36 Śubhakṛit | | 1 Chaitra | 9890 | 29.670 | 86 | 0.258 |
| 3451 | 272 | 407 | — | — | 349-50 | 37 Śobhana | | | | | | |
| 3452 | 273 | 408 | — | — | 350-51 | 38 Krodhin | | 6 Bhâdrapada | 9968 | 29.904 | 438 | 1.314 |
| 3453 | 274 | 409 | — | — | 351-52 | 39 Viśvâvasu | | | | | | |
| 3454 | 275 | 410 | — | — | *352-53 | 40 Parâbhava | | | | | | |
| 3455 | 276 | 411 | — | — | 353-54 | 41 Plavaṅga | | 4 Âshâḍha | 9701 | 29.103 | 550 | 1.650 |
| 3456 | 277 | 412 | — | — | 354-55 | 42 Kîlaka | | | | | | |
| 3457 | 278 | 413 | — | — | 355-56 | 43 Saumya | | | | | | |
| 3458 | 279 | 414 | — | — | *356-57 | 44 Sâdhâraṇa | | 3 Jyeshṭha | 9956 | 29.868 | 603 | 1.809 |
| 3459 | 280 | 415 | — | — | 357-58 | 45 Virodhakṛit | | | | | | |
| 3460 | 281 | 416 | — | — | 358-59 | 46 Paridhâvin | | 7 Âśvina | 9933 | 29.799 | 256 | 0.768 |
| 3461 | 282 | 417 | — | — | 359-60 | 47 Pramâdin | | | | | | |
| 3462 | 283 | 418 | — | — | *360-61 | 48 Ânanda | | | | | | |
| 3463 | 284 | 419 | — | — | 361-62 | 49 Râkshasa | | 4 Âshâḍha | 9245 | 27.735 | 67 | 0.201 |
| 3464 | 285 | 420 | — | — | 362-63 | 50 Anala | | | | | | |
| 3465 | 286 | 421 | — | — | 363-64 | 51 Piṅgala | | | | | | |
| 3466 | 287 | 422 | — | — | *364-65 | 52 Kâlayukta | | 3 Jyeshṭha | 9443 | 28.329 | 192 | 0.576 |
| 3467 | 288 | 423 | — | — | 365-66 | 53 Siddhârthin | | | | | | |

# TABLE I.

(Col. 23) *a* = *Distance of moon from sun.* (Col. 24) *b* = *moon's mean anomaly.* (Col. 25) *c* = *sun's mean anomaly.*

| II. ADDED LUNAR MONTHS (continued.) | | | | | III. COMMENCEMENT OF THE | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean. | | | | | Solar year. | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | Kali. |
| Name of month. | Time of the preceding saṅkrânti expressed in: Lunation parts. (*l*) | Tithis. | Time of the succeeding saṅkrânti expressed in: Lunation parts. (*l*) | Tithis. | Day and Month A. D. | (Time of the Mesha saṅkrânti.) Week day. | By the Ârya Siddhânta. Gh. Pa. | H. M. | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. Moon's Age: Lunar parts elapsed. (*t*) | Tithis elapsed. | *a* | *b* | *c* | |
| 8a | 9a | 10a | 11a | 12a | 13 | 14 | 15 | 17 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| | | | | | 17 Mar. (76) | 0 Sat. | 9 41 | 3 52 | 4 Mar. (63) | 1 Sun. | 321 | 963 | 157 | 172 | 244 | 3435 |
| 4 Âshâdha | 9849 | 29.547 | 156 | 0.469 | 17 Mar. (76) | 1 Sun. | 25 12 | 10 5 | 21 Feb. (52) | 5 Thur. | 192 | 579 | 33 | 20 | 213 | 3436 |
| | | | | | 17 Mar. (76) | 2 Mon. | 40 44 | 16 17 | 12 Mar. (71) | 4 Wed. | 170 | 510 | 68 | 956 | 264 | 3437 |
| | | | | | 16 Mar. (76) | 3 Tues. | 56 15 | 22 30 | 1 Mar. (61) | 2 Mon. | 303 | 909 | 282 | 839 | 236 | 3438 |
| 1 Chaitra | 9992 | 29.975 | 299 | 0.897 | 17 Mar. (76) | 5 Thur. | 11 46 | 4 42 | 18 Feb. (49) | 6 Fri. | 172 | 516 | 158 | 686 | 205 | 3439 |
| | | | | | 17 Mar. (76) | 6 Fri. | 27 17 | 10 55 | 9 Mar. (68) | 5 Thur. | 235 | 705 | 192 | 622 | 256 | 3440 |
| 9 Mârgaśîrsha | 9827 | 29.481 | 134 | 0.403 | 17 Mar. (76) | 0 Sat. | 42 49 | 17 7 | 26 Feb. (57) | 2 Mon. | 236 | .708 | 68 | 469 | 225 | 3441 |
| | | | | | 16 Mar. (76) | 1 Sun. | 58 20 | 23 20 | 16 Mar. (76) | 1 Sun. | 322 | 966 | 103 | 406 | 277 | 3442 |
| | | | | | 17 Mar. (76) | 3 Tues. | 13 51 | 5 32 | 5 Mar. (64) | 5 Thur. | 259 | .777 | 9979 | 253 | 246 | 3443 |
| 6 Bhâdrapada | 9970 | 29.909 | 277 | 0.832 | 17 Mar. (76) | 4 Wed. | 29 23 | 11 45 | 22 Feb. (53) | 2 Mon. | 79 | .237 | 9854 | 100 | 215 | 3444 |
| | | | | | 17 Mar. (76) | 5 Thur. | 44 54 | 17 57 | 13 Mar. (72) | 1 Sun. | 60 | .180 | 9889 | 36 | 266 | 3445 |
| | | | | | 17 Mar. (77) | 0 Sat. | 0 25 | 0 10 | 2 Mar. (62) | 6 Fri. | 175 | .525 | 103 | 920 | 239 | 3446 |
| 2 Vaiśâkha | 9805 | 29.416 | 113 | 0.338 | 17 Mar. (76) | 1 Sun. | 15 56 | 6 22 | 20 Feb. (51) | 4 Wed. | 328 | .984 | 318 | 803 | 210 | 3447 |
| | | | | | 17 Mar. (76) | 2 Mon. | 31 27 | 12 35 | 10 Mar. (69) | 2 Mon. | 20 | .060 | 14 | 703 | 259 | 3448 |
| 11 Mâgha | 9948 | 29.844 | 255 | 0.766 | 17 Mar. (76) | 3 Tues. | 46 59 | 18 47 | 28 Feb. (59) | 0 Sat. | 296 | .888 | 228 | 586 | 231 | 3449 |
| | | | | | 17 Mar. (77) | 5 Thur. | 2 30 | 1 0 | 17 Feb. (48) | 4 Wed. | 304 | .912 | 104 | 433 | 200 | 3450 |
| | | | | | 17 Mar. (76) | 6 Fri. | 18 1 | 7 12 | 6 Mar. (65) | 2 Mon. | 62 | .186 | 9800 | 333 | 249 | 3451 |
| 7 Âśvina | 9783 | 29.350 | 91 | 0.272 | 17 Mar. (76) | 0 Sat. | 33 32 | 13 25 | 24 Feb. (55) | 0 Sat. | 292 | .876 | 14 | 217 | 221 | 3452 |
| | | | | | 17 Mar. (76) | 1 Sun. | 49 4 | 19 37 | 15 Mar. (74) | 6 Fri. | 303 | .909 | 49 | 152 | 272 | 3453 |
| | | | | | 17 Mar. (77) | 3 Tues. | 4 35 | 1 50 | 3 Mar. (63) | 3 Tues. | 64 | .192 | 9924 | 1000 | 241 | 3454 |
| 4 Âshâdha | 9926 | 29.778 | 234 | 0.701 | 17 Mar. (76) | 4 Wed. | 20 6 | 8 2 | 21 Feb. (52) | 1 Sun. | 187 | .561 | 139 | 883 | 213 | 3455 |
| | | | | | 17 Mar. (76) | 5 Thur. | 35 37 | 14 15 | 12 Mar. (71) | 0 Sat. | 186 | .558 | 173 | 819 | 264 | 3456 |
| 12 Phâlguna | 9762 | 29.285 | 69 | 0.207 | 17 Mar. (76) | 6 Fri. | 51 9 | 20 27 | 1 Mar. (60) | 4 Wed. | 68 | .204 | 49 | 666 | 234 | 3457 |
| | | | | | 17 Mar. (77) | 1 Sun. | 6 40 | 2 40 | 18 Feb. (49) | 1 Sun. | 55 | .165 | 9925 | 514 | 202 | 3458 |
| | | | | | 17 Mar. (76) | 2 Mon. | 22 11 | 8 52 | 8 Mar. (67) | 0 Sat. | 144 | .432 | 9960 | 450 | 254 | 3459 |
| 9 Mârgaśîrsha | 9904 | 29.713 | 212 | 0.635 | 17 Mar. (76) | 3 Tues. | 37 42 | 15 5 | 25 Feb. (56) | 4 Wed. | 110 | .330 | 9835 | 297 | 223 | 3460 |
| | | | | | 17 Mar. (76) | 4 Wed. | 53 14 | 21 17 | 16 Mar. (75) | 3 Tues. | 148 | .444 | 9870 | 233 | 274 | 3461 |
| | | | | | 17 Mar. (77) | 6 Fri. | 8 45 | 3 30 | 5 Mar. (65) | 1 Sun. | 318 | .954 | 85 | 116 | 246 | 3462 |
| 5 Śrâvaṇa | 9740 | 29.219 | 47 | 0.141 | 17 Mar. (76) | 0 Sat. | 24 16 | 9 42 | 22 Feb. (53) | 5 Thur. | 70 | .210 | 9960 | 963 | 215 | 3463 |
| | | | | | 17 Mar. (76) | 1 Sun. | 39 47 | 15 55 | 13 Mar. (72) | 4 Wed. | 52 | .156 | 9994 | 900 | 267 | 3464 |
| | | | | | 17 Mar. (76) | 2 Mon. | 55 19 | 22 7 | 3 Mar. (62) | 2 Mon. | 212 | .636 | 209 | 783 | 239 | 3465 |
| 2 Vaiśâkha | 9882 | 29.647 | 190 | 0.570 | 17 Mar. (77) | 4 Wed. | 10 50 | 4 20 | 20 Feb. (51) | 6 Fri. | 124 | .372 | 84 | 630 | 208 | 3466 |
| | | | | | 17 Mar. (76) | 5 Thur. | 26 21 | 10 32 | 10 Mar. (69) | 5 Thur. | 202 | .606 | 119 | 566 | 259 | 3467 |

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| Kali. | Saka. | Chaitrâdi Vikrama. | Mahâdi (Solar) year in Bengal. | Kollam. | A. D. | (Southern.) | Brihaspati cycle (Northern) current at Mesha saṅkrânti. | Name of month. | Time of the preceding saṅkrânti expressed in: Lunation parts (l.) | Time of the preceding saṅkrânti expressed in: Tithis. | Time of the succeeding saṅkrânti expressed in: Lunation parts (l.) | Time of the succeeding saṅkrânti expressed in: Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 3468 | 289 | 424 | — | — | 366-67 | 54 Raudra | | 12 Phâlguna | 9914 | 29.742 | 16 | 0.048 |
| 3469 | 290 | 425 | — | — | 367-68 | 55 Durmati | | | | | | |
| 3470 | 291 | 426 | — | — | *368-69 | 56 Dundubhi | | | | | | |
| 3471 | 292 | 427 | — | — | 369-70 | 57 Rudhirodgârin | | 5 Śrâvaṇa | 9374 | 28.122 | 196 | 0.588 |
| 3472 | 293 | 428 | — | — | 370-71 | 58 Raktâksha | | | | | | |
| 3473 | 294 | 429 | — | — | 371-72 | 59 Krodhana | | | | | | |
| 3474 | 295 | 430 | — | — | *372-73 | 60 Kshaya | | 4 Âshâḍha | 9658 | 28.974 | 531 | 1.593 |
| 3475 | 296 | 431 | — | — | 373-74 | 1 Prabhava | | | | | | |
| 3476 | 297 | 432 | — | — | 374-75 | 2 Vibhava | | | | | | |
| 3477 | 298 | 433 | — | — | 375-76 | 3 Śukla | | 2 Vaiśâkha | 9747 | 29.241 | 136 | 0.408 |
| 3478 | 299 | 434 | — | — | *376-77 | 4 Pramoda | | | | | | |
| 3479 | 300 | 435 | — | — | 377-78 | 5 Prajâpati | | 6 Bhâdrapada | 9663 | 28.989 | 77 | 0.231 |
| 3480 | 301 | 436 | — | — | 378-79 | 6 Angiras | | | | | | |
| 3481 | 302 | 437 | — | — | 379-80 | 7 Śrîmukha | | | | | | |
| 3482 | 303 | 438 | — | — | *380-81 | 8 Bhâva | | 4 Âshâḍha | 9202 | 27.606 | 140 | 0.420 |
| 3483 | 304 | 439 | — | — | 381-82 | 9 Yuvan | | | | | | |
| 3484 | 305 | 440 | — | — | 382-83 | 10 Dhâtri | | | | | | |
| 3485 | 306 | 441 | — | — | 383-84 | 11 Îśvara | | 3 Jyeshṭha | 9602 | 28.806 | 186 | 0.558 |
| 3486 | 307 | 442 | — | — | *384-85 | 12 Bahudhânya | | | | | | |
| 3487 | 308 | 443 | — | — | 385-86 | 13 Pramâthin | | 12 Phâlguna | 9895 | 29.685 | 41 | 0.123 |
| 3488 | 309 | 444 | — | — | 386-87 | 14 Vikrama | | | | | | |
| 3489 | 310 | 445 | — | — | 387-88 | 15 Vṛisha | | | | | | |
| 3490 | 311 | 446 | — | — | *388-89 | 16 Chitrabhânu | | 5 Śrâvaṇa | 9613 | 28.839 | 336 | 1.008 |
| 3491 | 312 | 447 | — | — | 389-90 | 17 Subhânu | | | | | | |
| 3492 | 313 | 448 | — | — | 390-91 | 18 Târaṇa | | | | | | |
| 3493 | 314 | 449 | — | — | 391-92 | 19 Pârthiva | | 4 Âshâḍha | 9687 | 29.061 | 491 | 1.473 |
| 3494 | 315 | 450 | — | — | *392-93 | 20 Vyaya | | | | | | |
| 3495 | 316 | 451 | — | — | 393-94 | 21 Sarvajit | | | | | | |
| 3496 | 317 | 452 | — | — | 394-95 | 22 Sarvadhârin | | 2 Vaiśâkha | 9875 | 29.625 | 323 | 0.969 |
| 3497 | 318 | 453 | — | — | 395-96 | 23 Virodhin | | | | | | |
| 3498 | 319 | 454 | — | — | *396-97 | 24 Vikṛita | | 6 Bhâdrapada | 9831 | 29.493 | 270 | 0.810 |
| 3499 | 320 | 455 | — | — | 397-98 | 25 Khara [1] | | | | | | |
| 3500 | 321 | 456 | — | — | 398-99 | 27 Vijaya | | | | | | |

[1] Nandana, No. 26, was suppressed.

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

| II. ADDED LUNAR MONTHS (continued.) | | | | | III. COMMENCEMENT OF THE | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean [sic] | | | | | Solar year | | | | | | Luni-Solar year (Civil day of Chaitra Śukla 1st.) | | | | | | | Kali |
| Name of month | Time of the preceding saṅkrânti expressed in Lunation parts (l.) | Time of the preceding saṅkrânti expressed in Tithis | Time of the succeeding saṅkrânti expressed in Lunation parts (l.) | Time of the succeeding saṅkrânti expressed in Tithis | Day and Month A. D. | (Time of the Mesha saṅkrânti) Week day. | By the Ârya Siddhânta. Gh. | Pa. | H. | M. | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. Moon's Age. Lunat. parts elapsed. (l.) | Tithis elapsed. | a. | b. | c. | |
| 8a | 9a | 10a | 11a | 12a | 13 | 14 | 15 | | 17 | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 10 Pausha | 9718 | 29.154 | 25 | 0.076 | 17 Mar. (76) | 6 Fri. | 41 | 32 | 16 | 37 | 27 Feb. (58) | 2 Mon. | 207 | .621 | 9995 | 414 | 228 | 3468 |
| | | | | | 17 Mar. (76) | 0 Sat. | 57 | 24 | 22 | 57 | 18 Mar. (77) | 1 Sun. | 284 | .852 | 30 | 349 | 279 | 3469 |
| | | | | | 17 Mar. (77) | 2 Mon. | 12 | 55 | 5 | 10 | 8 Mar. (66) | 5 Thur. | 177 | .531 | 9905 | 197 | 249 | 3470 |
| 7 Âśvina | 9861 | 29.582 | 168 | 0.504 | 17 Mar. (76) | 3 Tues. | 28 | 26 | 11 | 22 | 24 Feb. (55) | 3 Tues. | 320 | .967 | 120 | 60 | 221 | 3471 |
| | | | | | 17 Mar. (76) | 4 Wed. | 43 | 57 | 17 | 35 | 15 Mar. (74) | 2 Mon. | 308 | .924 | 154 | 16 | 272 | 3472 |
| | | | | | 17 Mar. (76) | 5 Thur. | 59 | 29 | 23 | 47 | 4 Mar. (63) | 6 Fri. | 64 | .192 | 30 | 863 | 241 | 3473 |
| 3 Jyeshtha | 9696 | 29.088 | 3 | 0.009 | 17 Mar. (77) | 0 Sat. | 15 | 0 | 6 | 0 | 22 Feb. (53) | 4 Wed. | 246 | .738 | 244 | 747 | 218 | 3474 |
| | | | | | 17 Mar. (76) | 1 Sun. | 30 | 31 | 12 | 12 | 12 Mar. (71) | 3 Tues. | 291 | .875 | 279 | 663 | 265 | 3475 |
| 12 Phâlguna | 9839 | 29.517 | 146 | 0.439 | 17 Mar. (76) | 2 Mon. | 46 | 2 | 18 | 25 | 1 Mar. (60) | 0 Sat. | 269 | .807 | 155 | 530 | 234 | 3476 |
| | | | | | 18 Mar. (77) | 4 Wed. | 1 | 34 | 0 | 37 | 18 Feb. (49) | 4 Wed. | 271 | .813 | 30 | 377 | 203 | 3477 |
| | | | | | 17 Mar. (77) | 5 Thur. | 17 | 5 | 6 | 50 | 7 Mar. (67) | 2 Mon. | 3 | .009 | 9726 | 277 | 252 | 3478 |
| 9 Mârgaśîrsha | 9982 | 29.945 | 289 | 0.867 | 17 Mar. (76) | 6 Fri. | 32 | 36 | 13 | 2 | 25 Feb. (56) | 0 Sat. | 200 | .600 | 9941 | 160 | 223 | 3479 |
| | | | | | 17 Mar. (76) | 0 Sat. | 48 | 7 | 19 | 15 | 16 Mar. (75) | 6 Fri. | 197 | .594 | 9975 | 97 | 275 | 3480 |
| | | | | | 18 Mar. (77) | 2 Mon. | 3 | 39 | 1 | 27 | 6 Mar. (65) | 4 Wed. | 312 | .936 | 190 | 980 | 246 | 3481 |
| 5 Śrâvaṇa | 9817 | 29.451 | 124 | 0.373 | 17 Mar. (77) | 3 Tues. | 19 | 10 | 7 | 40 | 23 Feb. (54) | 1 Sun. | 82 | .246 | 65 | 827 | 216 | 3482 |
| | | | | | 17 Mar. (76) | 4 Wed. | 34 | 41 | 13 | 52 | 13 Mar. (72) | 0 Sat. | 100 | .300 | 100 | 783 | 267 | 3483 |
| | | | | | 17 Mar. (76) | 5 Thur. | 50 | 12 | 20 | 5 | 2 Mar. (61) | 4 Wed. | 26 | .078 | 9976 | 610 | 238 | 3484 |
| 2 Vaiśâkha | 9960 | 29.879 | 267 | 0.801 | 18 Mar. (77) | 0 Sat. | 5 | 44 | 2 | 17 | 19 Feb. (50) | 1 Sun. | 32 | .096 | 9851 | 457 | 206 | 3485 |
| | | | | | 17 Mar. (77) | 1 Sun. | 21 | 15 | 8 | 30 | 9 Mar. (68) | 0 Sat. | 113 | .339 | 9886 | 394 | 257 | 3486 |
| 10 Pausha | 9795 | 29.386 | 103 | 0.308 | 17 Mar. (76) | 2 Mon. | 36 | 46 | 14 | 42 | 26 Feb. (57) | 4 Wed. | 42 | .126 | 9762 | 241 | 226 | 3487 |
| | | | | | 17 Mar. (76) | 3 Tues. | 52 | 17 | 20 | 55 | 17 Mar. (76) | 3 Tues. | 63 | .189 | 9796 | 177 | 277 | 3488 |
| | | | | | 18 Mar. (77) | 5 Thur. | 7 | 49 | 3 | 7 | 7 Mar. (66) | 1 Sun. | 203 | .609 | 11 | 60 | 249 | 3489 |
| 7 Âśvina | 9938 | 29.814 | 245 | 0.736 | 17 Mar. (77) | 6 Fri. | 23 | 20 | 9 | 20 | 25 Feb. (56) | 6 Fri. | 317 | .951 | 225 | 944 | 221 | 3490 |
| | | | | | 17 Mar. (76) | 0 Sat. | 38 | 51 | 15 | 32 | 15 Mar. (74) | 5 Thur. | 304 | .912 | 260 | 880 | 272 | 3491 |
| | | | | | 17 Mar. (76) | 1 Sun. | 54 | 22 | 21 | 45 | 4 Mar. (63) | 2 Mon. | 138 | .414 | 136 | 727 | 242 | 3492 |
| 3 Jyeshtha | 9773 | 29.320 | 81 | 0.242 | 18 Mar. (77) | 3 Tues. | 9 | 54 | 3 | 57 | 21 Feb. (52) | 6 Fri. | 90 | .270 | 11 | 574 | 211 | 3493 |
| | | | | | 17 Mar. (77) | 4 Wed. | 25 | 25 | 10 | 10 | 11 Mar. (71) | 5 Thur. | 177 | .531 | 46 | 510 | 262 | 3494 |
| 12 Phâlguna | 9916 | 29.748 | 223 | 0.670 | 17 Mar. (76) | 5 Thur. | 40 | 56 | 16 | 22 | 28 Feb. (59) | 2 Mon. | 172 | .516 | 9922 | 357 | 231 | 3495 |
| | | | | | 17 Mar. (76) | 6 Fri. | 56 | 27 | 22 | 35 | 17 Feb. (48) | 6 Fri. | 74 | .222 | 9797 | 205 | 200 | 3496 |
| | | | | | 18 Mar. (77) | 1 Sun. | 11 | 59 | 4 | 47 | 8 Mar. (67) | 5 Thur. | 80 | .240 | 9832 | 140 | 252 | 3497 |
| 8 Kârttika | 9752 | 29.255 | 59 | 0.177 | 17 Mar. (77) | 2 Mon. | 27 | 30 | 11 | 0 | 26 Feb. (57) | 3 Tues. | 208 | .624 | 46 | 24 | 223 | 3498 |
| | | | | | 17 Mar. (76) | 3 Tues. | 43 | 1 | 17 | 12 | 16 Mar. (75) | 2 Mon. | 187 | .561 | 81 | 960 | 275 | 3499 |
| | | | | | 17 Mar. (76) | 4 Wed. | 58 | 32 | 23 | 25 | 6 Mar. (65) | 0 Sat. | 319 | .957 | 295 | 844 | 247 | 3500 |

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara | | True. | | | | |
| Kali. | Saka. | Chaitrâdi. Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | (Southern.) | Brihaspati cycle (Northern) current at Mesha sankrânti. | Name of month. | Time of the preceding sankrânti expressed in: Lunation parts (t.) | Tithis. | Time of the succeeding sankrânti expressed in: Lunation parts (t.) | Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 3501 | 322 | 457 | — | — | 399-400 | 28 Jaya | | 4 Âshâḍha | 9199 | 27.597 | 34 | 0.102 |
| 3502 | 323 | 458 | — | — | *400-401 | 29 Manmatha | | | | | | |
| 3503 | 324 | 459 | — | — | 401- 2 | 30 Durmukha | | | | | | |
| 3504 | 325 | 460 | — | — | 402- 3 | 31 Hemalamba | | 3 Jyeshṭha | 9777 | 29.331 | 343 | 1.029 |
| 3505 | 326 | 461 | — | — | 403- 4 | 32 Vilamba | | | | | | |
| | | | — | — | | | | 8 Kârttika | 9957 | 29.871 | 20 | 0.060 |
| 3506 | 327 | 462 | — | — | *404- 5 | 33 Vikârin | | 9 Mârgaś. (Ksh.) | 20 | 0.060 | 9968 | 29.904 |
| | | | | | | | | 12 Phâlguna | 9859 | 29.577 | 2 | 0.006 |
| 3507 | 328 | 463 | — | — | 405- 6 | 34 Śârvari | | | | | | |
| 3508 | 329 | 464 | | | 406- 7 | 35 Plava | | | | | | |
| 3509 | 330 | 465 | — | — | 407- 8 | 36 Śubhakṛit | | 5 Śrâvaṇa | 9586 | 28.758 | 374 | 1.122 |
| 3510 | 331 | 466 | — | — | *408- 9 | 37 Śobhana | | | | | | |
| 3511 | 332 | 467 | — | — | 409- 10 | 38 Krodhin | | | | | | |
| 3512 | 333 | 468 | — | — | 410- 11 | 39 Viśvâvasu | | 4 Âshâḍha | 9813 | 29.439 | 515 | 1.545 |
| 3513 | 334 | 469 | — | — | 411- 12 | 40 Parâbhava | | | | | | |
| 3514 | 335 | 470 | — | — | *412- 13 | 41 Plavanga | | | | | | |
| 3515 | 336 | 471 | — | — | 413- 14 | 42 Kîlaka | | 2 Vaiśâkha | 9908 | 29.724 | 445 | 1.335 |
| 3516 | 337 | 472 | — | — | 414- 15 | 43 Saumya | | | | | | |
| 3517 | 338 | 473 | — | — | 415- 16 | 44 Sâdhâraṇa | | 6 Bhâdrapada | 9911 | 29.733 | 434 | 1.302 |
| 3518 | 339 | 474 | — | — | *416- 17 | 45 Virodhakṛit | | | | | | |
| 3519 | 340 | 475 | — | — | 417- 18 | 46 Paridhâvin | | | | | | |
| 3520 | 341 | 476 | — | — | 418- 19 | 47 Pramâdin | | 4 Âshâḍha | 9294 | 27.882 | 30 | 0.090 |
| 3521 | 342 | 477 | — | — | 419- 20 | 48 Ânanda | | | | | | |
| 3522 | 343 | 478 | — | — | *420- 21 | 49 Râkshasa | | | | | | |
| 3523 | 344 | 479 | — | — | 421- 22 | 50 Anala | | 3 Jyeshṭha | 9949 | 29.847 | 542 | 1.626 |
| 3524 | 345 | 480 | — | — | 422- 23 | 51 Piṅgala | | | | | | |
| 3525 | 346 | 481 | — | — | 423- 24 | 52 Kâlayukta | | 7 Âśvina | 9920 | 29.760 | 154 | 0.462 |
| | | | — | — | | | | 10 Pausha (Ksh.) | 93 | 0.279 | 9955 | 29.865 |
| 3526 | 347 | 482 | — | — | *424- 25 | 53 Siddhârthin | | 1 Chaitra | 9985 | 29.955 | 324 | 0.972 |
| 3527 | 348 | 483 | | | 425- 26 | 54 Raudra | | | | | | |
| 3528 | 349 | 484 | — | — | 426- 27 | 55 Durmati | | 5 Śrâvaṇa | 9554 | 28.662 | 349 | 1.047 |
| 3529 | 350 | 485 | — | — | 427- 28 | 56 Dundubhi | | | | | | |
| 3530 | 351 | 486 | — | — | *428- 29 | 57 Rudhirodgârin | | | | | | |

# TABLE I.

(*Col.* 23) *a* = *Distance of moon from sun.* (*Col.* 24) *b* = *moon's mean anomaly.* (*Col.* 25) *c* = *sun's mean anomaly.*

| II. ADDED LUNAR MONTHS (*continued.*) | | | | | III. COMMENCEMENT OF THE | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean. | | | | | Solar year. | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | | Kali. |
| Name of month. | Time of the preceding saṅkrânti expressed in | | Time of the succeeding saṅkrânti expressed in | | Day and Month A. D. | (Time of the Mesha saṅkrânti.) | | | | | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. | | | | | | |
| | | | | | | Week day. | By the Ârya Siddhânta. | | | | | | Moon's Age. | | | | | | |
| | Lunation parts. (*t.*) | Tithis. | Lunation parts. (*t.*) | Tithis. | | | Gh. | Pa. | H. | M. | | | Lunat. parts elapsed. (*t.*) | Tithis elapsed. | *a.* | *b.* | *c.* | | |
| 8a | 9a | 10a | 11a | 12a | 13 | 14 | 15 | | 17 | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 | |
| 5 Śrâvaṇa ... | 9894 | 29.682 | 202 | 0.605 | 18 Mar. (77) | 6 Fri. | 14 | 4 | 5 | 37 | 23 Feb. (54) | 4 Wed. | 182 | .546 | 171 | 891 | 216 | 3501 | |
| ............ | .... | ...... | .... | ...... | 17 Mar. (77) | 0 Sat. | 29 | 35 | 11 | 50 | 13 Mar. (73) | 3 Tues. | 246 | .738 | 206 | 627 | 267 | 3502 | |
| ............ | .... | ...... | .... | ...... | 17 Mar. (76) | 1 Sun. | 45 | 6 | 18 | 2 | 2 Mar. (61) | 0 Sat. | 246 | .738 | 82 | 474 | 236 | 3503 | |
| 1 Chaitra ..... | 9730 | 29.189 | 37 | 0.111 | 18 Mar. (77) | 3 Tues. | 0 | 37 | 0 | 15 | 19 Feb. (50) | 4 Wed. | 226 | .678 | 9957 | 321 | 206 | 3504 | |
| ............ | .... | ...... | .... | ...... | 18 Mar. (77) | 4 Wed. | 16 | 9 | 6 | 27 | 10 Mar. (69) | 3 Tues. | 272 | .816 | 9992 | 257 | 257 | 3505 | |
| 10 Pausha .... | 9872 | 29.617 | 180 | 0.539 | 17 Mar. (77) | 5 Thur. | 31 | 40 | 12 | 40 | 27 Feb. (58) | 0 Sat. | 94 | .282 | 9868 | 104 | 226 | 3506 | |
| ............ | .... | ...... | .... | ...... | 17 Mar. (76) | 6 Fri. | 47 | 11 | 18 | 52 | 17 Mar. (76) | 6 Fri. | 78 | .234 | 9902 | 40 | 277 | 3507 | |
| ............ | .... | ...... | .... | ...... | 18 Mar. (77) | 1 Sun. | 2 | 42 | 1 | 5 | 7 Mar. (66) | 4 Wed. | 192 | .576 | 117 | 924 | 249 | 3508 | |
| 6 Bhâdrapada .. | 9708 | 29.124 | 15 | 0.046 | 18 Mar. (77) | 2 Mon. | 18 | 14 | 7 | 17 | 24 Feb. (55) | 1 Sun. | ⊙ —[illegible] | —[illegible] | 9992 | 771 | 219 | 3509 | |
| ............ | .... | ...... | .... | ...... | 17 Mar. (77) | 3 Tues. | 33 | 45 | 13 | 30 | 14 Mar. (74) | 0 Sat. | 32 | .096 | 27 | 707 | 270 | 3510 | |
| ............ | .... | ...... | .... | ...... | 17 Mar. (76) | 4 Wed. | 49 | 16 | 19 | 42 | 4 Mar. (63) | 5 Thur. | 306 | .918 | 241 | 590 | 242 | 3511 | |
| 3 Jyeshṭha .... | 9851 | 29.552 | 158 | 0.474 | 18 Mar. (77) | 6 Fri. | 4 | 47 | 1 | 55 | 21 Feb. (52) | 2 Mon. | 313 | 939 | 117 | 438 | 211 | 3512 | |
| ............ | .... | ...... | .... | ...... | 18 Mar. (77) | 0 Sat. | 20 | 19 | 8 | 7 | 11 Mar. (70) | 0 Sat. | 73 | .219 | 9813 | 337 | 260 | 3513 | |
| 12 Phâlguna ... | 9993 | 29.980 | 301 | 0.902 | 17 Mar. (77) | 1 Sun. | 35 | 50 | 14 | 20 | 29 Feb. (60) | 5 Thur. | 304 | .912 | 27 | 221 | 231 | 3514 | |
| ............ | .... | ...... | .... | ...... | 17 Mar. (76) | 2 Mon. | 51 | 21 | 20 | 32 | 17 Feb. (48) | 2 Mon. | 104 | .312 | 9903 | 68 | 201 | 3515 | |
| ............ | .... | ...... | .... | ...... | 18 Mar. (77) | 4 Wed. | 6 | 52 | 2 | 45 | 8 Mar. (67) | 1 Sun. | 82 | .246 | 9938 | 4 | 252 | 3516 | |
| 8 Kârttika .... | 9829 | 29.486 | 136 | 0.408 | 18 Mar. (77) | 5 Thur. | 22 | 14 | 8 | 57 | 26 Feb. (57) | 6 Fri. | 201 | .606 | 152 | 887 | 224 | 3517 | |
| ............ | .... | ...... | .... | ...... | 17 Mar. (77) | 6 Fri. | 37 | 55 | 15 | 10 | 16 Mar. (76) | 5 Thur. | 202 | .606 | 187 | 824 | 275 | 3518 | |
| ............ | .... | ...... | .... | ...... | 17 Mar. (76) | 0 Sat. | 53 | 26 | 21 | 22 | 5 Mar. (64) | 2 Mon. | 80 | .240 | 63 | 671 | 244 | 3519 | |
| 5 Śrâvaṇa .... | 9972 | 29.915 | 279 | 0.837 | 18 Mar. (77) | 2 Mon. | 8 | 57 | 3 | 35 | 22 Feb. (53) | 6 Fri. | 64 | .192 | 9938 | 518 | 213 | 3520 | |
| ............ | .... | ...... | .... | ...... | 18 Mar. (77) | 3 Tues. | 24 | 29 | 9 | 47 | 13 Mar. (72) | 5 Thur. | 153 | .459 | 9973 | 454 | 265 | 3521 | |
| ............ | .... | ...... | .... | ...... | 17 Mar. (77) | 4 Wed. | 40 | 0 | 16 | 0 | 1 Mar. (61) | 2 Mon. | 122 | .366 | 9849 | 301 | 234 | 3522 | |
| 1 Chaitra ..... | 9807 | 29.421 | 114 | 0.343 | 17 Mar. (76) | 5 Thur. | 55 | 31 | 22 | 12 | 18 Feb. (49) | 6 Fri. | ⊙ —[illegible] | —[illegible] | 9724 | 148 | 203 | 3523 | |
| ............ | .... | ...... | .... | ...... | 18 Mar. (77) | 0 Sat. | 11 | 2 | 4 | 25 | 9 Mar. (68) | 5 Thur. | ⊙ —[illegible] | —[illegible] | 9759 | 84 | 255 | 3524 | |
| 10 Pausha .... | 9930 | 29.849 | 237 | 0.771 | 18 Mar. (77) | 1 Sun. | 26 | 34 | 10 | 37 | 27 Feb. (58) | 3 Tues. | 85 | .255 | 9973 | 968 | 226 | 3525 | |
| ............ | .... | ...... | .... | ...... | 17 Mar. (77) | 2 Mon. | 42 | 5 | 16 | 50 | 17 Feb. (48) | 1 Sun. | 219 | .657 | 188 | 851 | 198 | 3526 | |
| ............ | .... | ...... | .... | ...... | 17 Mar. (76) | 3 Tues. | 57 | 36 | 23 | 2 | 7 Mar. (66) | 0 Sat. | 226 | .678 | 222 | 787 | 250 | 3527 | |
| 6 Bhâdrapada .. | 9785 | 29.355 | 93 | 0.278 | 18 Mar. (77) | 5 Thur. | 13 | 7 | 5 | 15 | 24 Feb. (55) | 4 Wed. | 134 | .402 | 95 | 635 | 219 | 3528 | |
| ............ | .... | ...... | .... | ...... | 18 Mar. (77) | 6 Fri. | 28 | 39 | 11 | 27 | 15 Mar. (74) | 3 Tues. | 213 | .639 | 133 | 570 | 270 | 3529 | |
| ............ | .... | ...... | .... | ...... | 17 Mar. (77) | 0 Sat. | 44 | 10 | 17 | 40 | 3 Mar. (63) | 0 Sat. | 217 | .651 | 5 | 418 | 239 | 3530 | |

⊙ See Text. Art. 101 above, para. 2.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| Kali. | Śaka. | Chaitrâdi. Vikrama. | Mcdhâdi (Solar) year in Bengal. | Kollam. | A. D. | (Southern.) | Bṛihaspati cycle (Northern) current at Mesha saṅkrânti. | Name of month. | Time of the preceding saṅkrânti expressed in Lunation parts. (l.) | Time of the preceding saṅkrânti expressed in Tithis. | Time of the succeeding saṅkrânti expressed in Lunation parts. (l.) | Time of the succeeding saṅkrânti expressed in Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 3531 | 352 | 487 | — | — | 429-30 | 58 Raktâksha | | 3 Jyeshṭha | 9440 | 28.320 | 8 | 0.024 |
| 3532 | 353 | 488 | — | — | 430-31 | 59 Krodhana | | | | | | |
| 3533 | 354 | 489 | — | — | 431-32 | 60 Kshaya | | | | | | |
| 3534 | 355 | 490 | — | — | *432-33 | 1 Prabhava | | 2 Vaiśâkha | 9870 | 29.610 | 462 | 1.386 |
| 3535 | 356 | 491 | — | — | 433-34 | 2 Vibhava | | | | | | |
| 3536 | 357 | 492 | — | — | 434-35 | 3 Śukla | | 6 Bhâdrapada | 9895 | 29.685 | 502 | 1.506 |
| 3537 | 358 | 493 | — | — | 435-36 | 4 Pramoda | | | | | | |
| 3538 | 359 | 494 | — | — | *436-37 | 5 Prajâpati | | | | | | |
| 3539 | 360 | 495 | — | — | 437-38 | 6 Âṅgiras | | 4 Âshâḍha | 9475 | 28.425 | 118 | 0.354 |
| 3540 | 361 | 496 | — | — | 438-39 | 7 Śrîmukha | | | | | | |
| 3541 | 362 | 497 | — | — | 439-40 | 8 Bhâva | | | | | | |
| 3542 | 363 | 498 | — | — | *440-41 | 9 Yuvan | | 3 Jyeshṭha | 9998 | 29.994 | 689 | 2.067 |
| 3543 | 364 | 499 | — | — | 441-42 | 10 Dhâtṛi | | | | | | |
| 3544 | 365 | 500 | — | — | 442-43 | 11 Îśvara | | 6 Bhâdrapada | 9440 | 28.320 | 22 | 0.066 |
| 3545 | 366 | 501 | — | — | 443-44 | 12 Bahudhânya | | | | | | |
| 3546 | 367 | 502 | — | — | *444-45 | 13 Pramâthin | | | | | | |
| 3547 | 368 | 503 | — | — | 445-46 | 14 Vikrama | | 5 Śrâvaṇa | 9608 | 28.824 | 319 | 0.957 |
| 3548 | 369 | 504 | — | — | 446-47 | 15 Vṛisha | | | | | | |
| 3549 | 370 | 505 | — | — | 447-48 | 16 Chitrabhânu | | | | | | |
| 3550 | 371 | 506 | — | — | *448-49 | 17 Subhânu | | 3 Jyeshṭha | 9524 | 28.572 | 182 | 0.546 |
| 3551 | 372 | 507 | — | — | 449-50 | 18 Târaṇa | | | | | | |
| 3552 | 373 | 508 | — | — | 450-51 | 19 Pârthiva | | | | | | |
| 3553 | 374 | 509 | — | — | 451-52 | 20 Vyaya | | 2 Vaiśâkha | 9847 | 29.541 | 423 | 1.269 |
| 3554 | 375 | 510 | — | — | *452-53 | 21 Sarvajit | | | | | | |
| 3555 | 376 | 511 | — | — | 453-54 | 22 Sarvadhârin | | 6 Bhâdrapada | 9858 | 29.574 | 485 | 1.455 |
| 3556 | 377 | 512 | — | — | 454-55 | 23 Virodhin | | | | | | |
| 3557 | 378 | 513 | — | — | 455-56 | 24 Vikṛita | | | | | | |
| 3558 | 379 | 514 | — | — | *456-57 | 25 Khara | | 4 Âshâḍha | 9653 | 28.959 | 291 | 0.873 |
| 3559 | 380 | 515 | — | — | 457-58 | 26 Nandana | | | | | | |
| 3560 | 381 | 516 | — | — | 458-59 | 27 Vijaya | | | | | | |
| 3561 | 382 | 517 | — | — | 459-60 | 28 Jaya | | 3 Jyeshṭha | 9670 | 29.010 | 674 | 2.022 |
| 3562 | 383 | 518 | — | — | *460-61 | 29 Manmatha | | | | | | |
| 3563 | 384 | 519 | — | — | 461-62 | 30 Durmukha | | 6 Bhâdrapada | 9398 | 28.194 | 28 | 0.084 |

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

| II. ADDED LUNAR MONTHS (continued.) | | | | | III. COMMENCEMENT OF THE | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean. | | | | | Solar year. | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | Kali. |
| Name of month. | Time of the preceding saṅkrânti expressed in | | Time of the succeeding saṅkrânti expressed in | | Day and Month A. D. | (Time of the Mesha saṅkrânti.) | | | | | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. | | | | | |
| | | | | | | Week day. | By the Ârya Siddhânta | | | | | | Moon's Age | | | | | |
| | Lunation parts. (*t*) | Tithis. | Lunation parts. (*t*) | Tithis. | | | Gh. | Pa. | H. | M. | | | Lunat. parts elapsed. (*t*) | Tithis elapsed. | *a.* | *b.* | *c.* | |
| 8a | 9a | 10a | 11a | 12a | 13 | 14 | 15 | | 17 | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 3 Jyeshṭha.... | 9928 | 29.784 | 235 | 0.706 | 17 Mar. (76) | 1 Sun. | 59 | 41 | 23 | 52 | 20 Feb. (51) | 4 Wed. | 166 | .498 | 9854 | 265 | 208 | 3531 |
| ... | ... | ... | ... | ... | 18 Mar. (77) | 3 Tues. | 15 | 12 | 6 | 5 | 11 Mar. (70) | 3 Tues. | 192 | .576 | 9919 | 201 | 260 | 3532 |
| 11 Mâgha..... | 9763 | 29.290 | 71 | 0.212 | 18 Mar. (77) | 4 Wed. | 30 | 44 | 12 | 17 | 28 Feb. (59) | 0 Sat. | ⊙—24 | —.072 | 9794 | 48 | 229 | 3533 |
| ... | ... | ... | ... | ... | 17 Mar. (77) | 5 Thur. | 46 | 15 | 18 | 30 | 18 Feb. (49) | 5 Thur. | 93 | .279 | 6 | 932 | 201 | 3534 |
| ... | ... | ... | ... | ... | 18 Mar. (77) | 0 Sat. | 1 | 46 | 0 | 42 | 8 Mar. (67) | 4 Wed. | 79 | .237 | 43 | 868 | 252 | 3535 |
| 8 Kârttika .... | 9906 | 29.718 | 213 | 0.640 | 18 Mar. (77) | 1 Sun. | 17 | 17 | 6 | 55 | 26 Feb. (57) | 2 Mon. | 258 | .774 | 257 | 751 | 224 | 3536 |
| ... | ... | ... | ... | ... | 18 Mar. (77) | 2 Mon. | 32 | 49 | 13 | 7 | 17 Mar. (76) | 1 Sun. | 304 | .912 | 292 | 687 | 275 | 3537 |
| ... | ... | ... | ... | ... | 17 Mar. (77) | 3 Tues. | 48 | 20 | 19 | 20 | 5 Mar. (65) | 5 Thur. | 278 | .834 | 168 | 534 | 245 | 3538 |
| 4 Âshâḍha .... | 9741 | 29.224 | 49 | 0.147 | 18 Mar. (77) | 5 Thur. | 3 | 51 | 1 | 32 | 22 Feb. (53) | 2 Mon. | 281 | .843 | 44 | 381 | 214 | 3539 |
| ... | ... | ... | ... | ... | 18 Mar. (77) | 6 Fri. | 19 | 22 | 7 | 45 | 12 Mar. (71) | 0 Sat. | 17 | .051 | 9740 | 281 | 262 | 3540 |
| ... | ... | ... | ... | ... | 18 Mar. (77) | 0 Sat. | 34 | 54 | 13 | 57 | 2 Mar. (61) | 5 Thur. | 214 | .642 | 9954 | 165 | 234 | 3541 |
| 1 Chaitra .... | 9884 | 29.653 | 192 | 0.575 | 17 Mar. (77) | 1 Sun. | 50 | 25 | 20 | 10 | 19 Feb. (50) | 2 Mon. | ⊙—11 | —.033 | 9830 | 12 | 203 | 3542 |
| ... | ... | ... | ... | ... | 18 Mar. (77) | 3 Tues. | 5 | 56 | 2 | 22 | 10 Mar. (69) | 2 Mon. | 329 | .987 | 203 | 984 | 257 | 3543 |
| 9 Mârgaśirsha.. | 9720 | 29.159 | 27 | 0.081 | 18 Mar. (77) | 4 Wed. | 21 | 27 | 8 | 35 | 27 Feb. (58) | 6 Fri. | 97 | .291 | 79 | 832 | 227 | 3544 |
| ... | ... | ... | ... | ... | 18 Mar. (77) | 5 Thur. | 36 | 59 | 14 | 47 | 15 Mar. (77) | 5 Thur. | 115 | .345 | 113 | 767 | 278 | 3545 |
| ... | ... | ... | ... | ... | 17 Mar. (77) | 6 Fri. | 52 | 30 | 21 | 0 | 6 Mar. (66) | 2 Mon. | 36 | .108 | 9989 | 615 | 247 | 3546 |
| 6 Bhâdrapada .. | 9862 | 29.587 | 170 | 0.509 | 18 Mar. (77) | 1 Sun. | 8 | 1 | 3 | 12 | 23 Feb. (54) | 6 Fri. | 39 | .117 | 9865 | 462 | 216 | 3547 |
| ... | ... | ... | ... | ... | 18 Mar. (77) | 2 Mon. | 23 | 32 | 9 | 25 | 14 Mar. (73) | 5 Thur. | 124 | .372 | 9900 | 398 | 268 | 3548 |
| ... | ... | ... | ... | ... | 18 Mar. (77) | 3 Tues. | 39 | 4 | 15 | 37 | 3 Mar. (62) | 2 Mon. | 55 | .165 | 9775 | 245 | 237 | 3549 |
| 2 Vaiśâkha.... | 9698 | 29.093 | 5 | 0.016 | 17 Mar. (77) | 4 Wed. | 54 | 35 | 21 | 50 | 21 Feb. (52) | 0 Sat. | 232 | .696 | 9989 | 129 | 209 | 3550 |
| ... | ... | ... | ... | ... | 18 Mar. (77) | 6 Fri. | 10 | 6 | 4 | 2 | 11 Mar. (70) | 6 Fri. | 219 | .657 | 24 | 64 | 260 | 3551 |
| 11 Mâgha...... | 9841 | 29.522 | 148 | 0.444 | 18 Mar. (77) | 0 Sat. | 25 | 37 | 10 | 15 | 1 Mar. (60) | 4 Wed. | 332 | .996 | 235 | 948 | 232 | 3552 |
| ... | ... | ... | ... | ... | 18 Mar. (77) | 1 Sun. | 41 | 9 | 16 | 27 | 18 Feb. (49) | 1 Sun. | 122 | .366 | 114 | 795 | 201 | 3553 |
| ... | ... | ... | ... | ... | 17 Mar. (77) | 2 Mon. | 56 | 40 | 22 | 40 | 8 Mar. (68) | 0 Sat. | 150 | .450 | 149 | 731 | 252 | 3554 |
| 8 Kârttika.... | 9983 | 29.950 | 291 | 0.872 | 18 Mar. (77) | 4 Wed. | 12 | 11 | 4 | 52 | 25 Feb. (56) | 4 Wed. | 99 | .297 | 24 | 578 | 221 | 3555 |
| ... | ... | ... | ... | ... | 18 Mar. (77) | 5 Thur. | 27 | 42 | 11 | 5 | 16 Mar. (75) | 3 Tues. | 186 | .558 | 59 | 515 | 274 | 3556 |
| ... | ... | ... | ... | ... | 18 Mar. (77) | 6 Fri. | 43 | 14 | 17 | 17 | 5 Mar. (64) | 0 Sat. | 182 | .546 | 9935 | 361 | 242 | 3557 |
| 4 Âshâḍha .... | 9819 | 29.456 | 126 | 0.378 | 17 Mar. (77) | 0 Sat. | 58 | 45 | 23 | 30 | 22 Feb. (53) | 4 Wed. | 89 | .267 | 9811 | 209 | 211 | 3558 |
| ... | ... | ... | ... | ... | 18 Mar. (77) | 2 Mon. | 14 | 16 | 5 | 42 | 12 Mar. (71) | 3 Tues. | 96 | .288 | 9845 | 145 | 262 | 3559 |
| ... | ... | ... | ... | ... | 18 Mar. (77) | 3 Tues. | 29 | 47 | 11 | 55 | 2 Mar. (61) | 1 Sun. | 224 | .672 | 60 | 28 | 234 | 3560 |
| 1 Chaitra..... | 9962 | 29.885 | 269 | 0.807 | 18 Mar. (77) | 4 Wed. | 45 | 19 | 18 | 7 | 19 Feb. (50) | 5 Thur. | ⊙—21 | —.063 | 9935 | 875 | 204 | 3561 |
| ... | ... | ... | ... | ... | 18 Mar. (78) | 6 Fri. | 0 | 50 | 0 | 20 | 9 Mar. (69) | 4 Wed. | ⊙—19 | —.057 | 9970 | 812 | 255 | 3562 |
| 9 Mârgaśirsha. | 9797 | 29.391 | 104 | 0.313 | 18 Mar. (77) | 0 Sat. | 16 | 21 | 6 | 32 | 27 Feb. (58) | 2 Mon. | 194 | .582 | 185 | 695 | 227 | 3563 |

⊙ See Text. Art. 101 above, para 2.

# TABLE I.

*Lunation-parts* = 10,000*ths of a circle. A tithi* = $^1/_{30}$*th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| | | | | | | | | | Time of the preceding saṅkrânti expressed in | | Time of the succeeding saṅkrânti expressed in | |
| Kali. | Śaka. | Chaitrâdi Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | (Southern.) | Bṛihaspati cycle (Northern) current at Mesha saṅkrânti. | Name of month | Lunation parts. (*t*.) | Tithis. | Lunation parts. (*t*.) | Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 3564 | 385 | 520 | — | — | 462-63 | ....... | 31 Hemalamba........ | | | | | |
| 3565 | 386 | 521 | — | — | 463-64 | ....... | 32 Vilamba........ | | | | | |
| 3566 | 387 | 522 | — | — | *464-65 | ....... | 33 Vikârin........ | 5 Śrâvaṇa.... | 9758 | 29.274 | 371 | 1.113 |
| 3567 | 388 | 523 | — | — | 465-66 | ....... | 34 Śârvari........ | | | | | |
| 3568 | 389 | 524 | — | — | 466-67 | ....... | 35 Plava........ | | | | | |
| 3569 | 390 | 525 | — | — | 467-68 | ....... | 36 Śubhakṛit........ | 3 Jyeshṭha.... | 9518 | 28.554 | 268 | 0.804 |
| 3570 | 391 | 526 | — | — | *468-69 | ....... | 37 Śobhana........ | | | | | |
| 3571 | 392 | 527 | — | — | 469-70 | ....... | 38 Krodhin........ | | | | | |
| 3572 | 393 | 528 | — | — | 470-71 | ....... | 39 Viśvâvasu........ | 2 Vaiśâkha.... | 9914 | 29.742 | 409 | 1.227 |
| 3573 | 394 | 529 | — | — | 471-72 | ....... | 40 Parâbhava........ | | | | | |
| 3574 | 395 | 530 | — | — | *472-73 | ....... | 41 Plavaṅga........ | 6 Bhâdrapada. | 9876 | 29.628 | 443 | 1.329 |
| 3575 | 396 | 531 | — | — | 473-74 | ....... | 42 Kîlaka........ | | | | | |
| 3576 | 397 | 532 | — | — | 474-75 | ....... | 43 Saumya........ | | | | | |
| 3577 | 398 | 533 | — | — | 475-76 | ....... | 44 Sâdhâraṇa........ | 4 Âshâḍha.... | 9783 | 29.349 | 482 | 1.446 |
| 3578 | 399 | 534 | — | — | *476-77 | ....... | 45 Virodhakṛit........ | | | | | |
| 3579 | 400 | 535 | — | — | 477-78 | ....... | 46 Paridhâvin........ | | | | | |
| 3580 | 401 | 536 | — | — | 478-79 | ....... | 47 Pramâdin........ | 3 Jyeshṭha.... | 9937 | 29.811 | 712 | 2.136 |
| 3581 | 402 | 537 | — | — | 479-80 | ....... | 48 Ânanda........ | | | | | |
| 3582 | 403 | 538 | — | — | *480-81 | ....... | 49 Râkshasa........ | 7 Âśvina..... | 9984 | 29.952 | 385 | 1.155 |
| 3583 | 404 | 539 | — | — | 481-82 | ....... | 50 Anala........ | | | | | |
| 3584 | 405 | 540 | — | — | 482-83 | ....... | 51 Piṅgala [1]........ | | | | | |
| 3585 | 406 | 541 | — | — | 483-84 | ....... | 53 Siddhârthin........ | 5 Śrâvaṇa.... | 9953 | 29.859 | 521 | 1.563 |
| 3586 | 407 | 542 | — | — | *484-85 | ....... | 54 Raudra........ | | | | | |
| 3587 | 408 | 543 | — | — | 485-86 | ....... | 55 Durmati........ | | | | | |
| 3588 | 409 | 544 | — | — | 486-87 | ....... | 56 Dundubhi........ | 3 Jyeshṭha.... | 9476 | 28.428 | 261 | 0.783 |
| 3589 | 410 | 545 | — | — | 487-88 | ....... | 57 Rudhirodgârin........ | | | | | |
| 3590 | 411 | 546 | — | — | *488-89 | ....... | 58 Raktâksha........ | 8 Kârttika.... | 9928 | 29.784 | 86 | 0.258 |
| | | | | | | | | 10 *Pausha (Ksh.)* | 64 | 0.192 | 9950 | 29.850 |
| 3591 | 412 | 547 | — | — | 489-90 | ....... | 59 Krodhana........ | 1 Chaitra..... | 9887 | 29.661 | 73 | 0.219 |
| 3592 | 413 | 548 | — | — | 490-91 | ....... | 60 Kshaya........ | | | | | |
| 3593 | 414 | 549 | — | — | 491-92 | ....... | 1 Prabhava........ | 6 Bhâdrapada.. | 9993 | 29.979 | 472 | 1.416 |
| 3594 | 415 | 550 | — | — | *492-93 | ....... | 2 Vibhava........ | | | | | |
| 3595 | 416 | 551 | — | — | 493-94 | ....... | 3 Śukla........ | | | | | |

[1] Kâlayukta, No. 52, was suppressed.

# TABLE I.

(Col. 23) *a* = *Distance of moon from sun.* (Col. 24) *b* = *moon's mean anomaly.* (Col. 25) *c* = *sun's mean anomaly.*

| II. ADDED LUNAR MONTHS (*continued.*) | | | | | III. COMMENCEMENT OF THE | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean | | | | | Solar year. | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | Kali. |
| Name of month. | Time of the preceding saṅkrânti expressed in: Lunation parts. (*t.*) | Time of the preceding saṅkrânti expressed in: Tithis. | Time of the succeeding saṅkrânti expressed in: Lunation parts. (*t.*) | Time of the succeeding saṅkrânti expressed in: Tithis. | Day and Month A. D. | (Time of the Mesha saṅkrânti.) Week day. | By the Ârya Siddhânta. Gh. | Pa. | H. | M. | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. Moon's Age. Lunat. parts elapsed. (*t.*) | Tithis elapsed. | *a* | *b* | *c* | |
| 8a | 9a | 10a | 11a | 12a | 13 | 14 | 15 | | 17 | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| .... | .... | .... | .... | .... | 18 Mar. (77) | 1 Sun. | 31 | 52 | 12 | 45 | 18 Mar. (77) | 1 Sun | 257 | .771 | 219 | 631 | 278 | 3564 |
| .... | .... | .... | .... | .... | 18 Mar. (77) | 2 Mon. | 47 | 24 | 18 | 57 | 7 Mar. (66) | 5 Thur. | 255 | .765 | 95 | 478 | 247 | 3565 |
| 6 Bhâdrapada | 9940 | 29.819 | 247 | 0.741 | 18 Mar. (78) | 4 Wed. | 2 | 55 | 1 | 10 | 24 Feb. (55) | 2 Mon. | 235 | .705 | 9970 | 326 | 216 | 3566 |
| .... | .... | .... | .... | .... | 18 Mar. (77) | 5 Thur. | 18 | 26 | 7 | 22 | 14 Mar. (73) | 1 Sun | 285 | .855 | 5 | 261 | 268 | 3567 |
| .... | .... | .... | .... | .... | 18 Mar. (77) | 6 Fri. | 33 | 57 | 13 | 35 | 3 Mar. (62) | 5 Thur. | 110 | .330 | 9851 | 109 | 237 | 3568 |
| 2 Vaiśâkha | 9775 | 29.325 | 82 | 0.247 | 18 Mar. (77) | 0 Sat. | 49 | 29 | 19 | 47 | 21 Feb. (52) | 3 Tues. | 230 | .690 | 95 | 992 | 209 | 3569 |
| .... | .... | .... | .... | .... | 18 Mar. (78) | 2 Mon. | 5 | 0 | 2 | 0 | 11 Mar. (71) | 2 Mon. | 208 | .624 | 150 | 928 | 260 | 3570 |
| 11 Mâgha | 9918 | 29.754 | 225 | 0.676 | 18 Mar. (77) | 3 Tues. | 20 | 31 | 8 | 12 | 28 Feb. (59) | 6 Fri. | 7 | .021 | 5 | 775 | 229 | 3571 |
| .... | .... | .... | .... | .... | 18 Mar. (77) | 4 Wed. | 36 | 2 | 14 | 25 | 18 Feb. (49) | 4 Wed. | 246 | .738 | 220 | 659 | 201 | 3572 |
| .... | .... | .... | .... | .... | 18 Mar. (77) | 5 Thur. | 51 | 34 | 20 | 37 | 8 Mar. (67) | 2 Mon. | 6 | .018 | 9916 | 558 | 250 | 3573 |
| 7 Âśvina | 9753 | 29.260 | 61 | 0.182 | 18 Mar. (78) | 0 Sat. | 7 | 5 | 2 | 50 | 26 Feb. (57) | 0 Sat. | 321 | .963 | 130 | 442 | 222 | 3574 |
| .... | .... | .... | .... | .... | 18 Mar. (77) | 1 Sun. | 22 | 36 | 9 | 2 | 15 Mar. (74) | 5 Thur. | 83 | .249 | 9826 | 342 | 270 | 3575 |
| .... | .... | .... | .... | .... | 18 Mar. (77) | 2 Mon. | 38 | 7 | 15 | 15 | 5 Mar. (64) | 3 Tues. | 319 | .957 | 41 | 225 | 242 | 3576 |
| 4 Âshâḍha | 9896 | 29.688 | 203 | 0.610 | 18 Mar. (77) | 3 Tues. | 53 | 39 | 21 | 27 | 22 Feb. (53) | 0 Sat. | 120 | .360 | 9916 | 72 | 211 | 3577 |
| .... | .... | .... | .... | .... | 18 Mar. (78) | 5 Thur. | 9 | 10 | 3 | 40 | 12 Mar. (72) | 6 Fri. | 99 | .297 | 9951 | 9 | 268 | 3578 |
| 12 Phâlguna | 9731 | 29.194 | 39 | 0.116 | 18 Mar. (77) | 6 Fri. | 24 | 41 | 9 | 52 | 2 Mar. (61) | 4 Wed. | 216 | .648 | 165 | 892 | 233 | 3579 |
| .... | .... | .... | .... | .... | 18 Mar. (77) | 0 Sat. | 40 | 12 | 16 | 5 | 19 Feb. (50) | 1 Sun. | 44 | .132 | 41 | 759 | 204 | 3580 |
| .... | .... | .... | .... | .... | 18 Mar. (77) | 1 Sun. | 55 | 44 | 22 | 17 | 10 Mar. (69) | 0 Sat. | 91 | .273 | 76 | 675 | 255 | 3581 |
| 9 Mârgaśirsha | 9874 | 29.623 | 182 | 0.545 | 18 Mar. (78) | 3 Tues. | 11 | 15 | 4 | 30 | 27 Feb. (58) | 4 Wed. | 71 | .214 | 9961 | 522 | 224 | 3582 |
| .... | .... | .... | .... | .... | 18 Mar. (77) | 4 Wed. | 26 | 46 | 10 | 42 | 17 Mar. (76) | 3 Tues. | 164 | .492 | 9956 | 455 | 270 | 3583 |
| .... | .... | .... | .... | .... | 18 Mar. (77) | 5 Thur. | 42 | 17 | 16 | 55 | 6 Mar. (65) | 0 Sat. | 182 | .396 | 9861 | 306 | 245 | 3584 |
| 5 Śrâvaṇa | 9710 | 29.129 | 17 | 0.051 | 18 Mar. (77) | 6 Fri. | 57 | 49 | 23 | 7 | 23 Feb. (54) | 4 Wed. | ⊛ — | — ⊛ | 9737 | 153 | 214 | 3585 |
| .... | .... | .... | .... | .... | 18 Mar. (78) | 1 Sun. | 13 | 20 | 5 | 20 | 13 Mar. (73) | 3 Tues. | ⊛ — | — ⊛ | 9772 | 89 | 265 | 3586 |
| .... | .... | .... | .... | .... | 18 Mar. (77) | 2 Mon. | 28 | 51 | 11 | 32 | 3 Mar. (62) | 1 Sun. | 102 | .306 | 9986 | 972 | 237 | 3587 |
| 2 Vaiśâkha | 9852 | 29.557 | 160 | 0.479 | 18 Mar. (77) | 3 Tues. | 44 | 22 | 17 | 45 | 21 Feb. (55) | 6 Fri. | 233 | .699 | 201 | 556 | 209 | 3588 |
| .... | .... | .... | .... | .... | 18 Mar. (77) | 4 Wed. | 59 | 54 | 23 | 57 | 12 Mar. (71) | 5 Thur. | 239 | .717 | 235 | 792 | 260 | 3589 |
| 11 Mâgha | 9995 | 29.985 | 303 | 0.908 | 18 Mar. (78) | 6 Fri. | 15 | 25 | 6 | 10 | 29 Feb. (60) | 2 Mon. | 144 | .432 | 111 | 639 | 230 | 3590 |
| .... | .... | .... | .... | .... | 18 Mar. (77) | 0 Sat. | 30 | 56 | 12 | 22 | 17 Feb. (48) | 6 Fri. | 143 | .429 | 9987 | 486 | 199 | 3591 |
| .... | .... | .... | .... | .... | 18 Mar. (77) | 1 Sun. | 46 | 27 | 18 | 35 | 8 Mar. (67) | 5 Thur. | 227 | .681 | 21 | 422 | 250 | 3592 |
| 7 Âśvina | 9831 | 29.492 | 138 | 0.414 | 19 Mar. (78) | 3 Tues. | 1 | 59 | 0 | 47 | 25 Feb. (56) | 2 Mon. | 177 | .531 | 9897 | 262 | 219 | 3593 |
| .... | .... | .... | .... | .... | 18 Mar. (78) | 4 Wed. | 17 | 30 | 7 | 0 | 15 Mar. (75) | 1 Sun. | 207 | .621 | 9932 | 205 | 271 | 3594 |
| .... | .... | .... | .... | .... | 18 Mar. (77) | 5 Thur. | 33 | 1 | 13 | 12 | 4 Mar. (63) | 5 Thur. | ⊛ — | — ⊛ | 9807 | 52 | 240 | 3595 |

⊛ See Text. Art. 101 above, para. 2.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = $^1/_{30}$th of the moon's synodic revolution.*

| I. CONCURRENT YEAR | | | | | | | | II. ADDED LUNAR MONTHS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| Kali. | Saka. | Chaitrâdi Vikrama | Meshâdi (Solar) year in Bengal | Kollam. | A. D. | (Southern.) | Bṛihaspati cycle (Northern) current at Mesha saṅkrânti. | Name of month | Time of the preceding saṅkrânti expressed in: Lunation parts. (l.) | Tithis. | Time of the succeeding saṅkrânti expressed in: Lunation parts. (l.) | Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 3596 | 417 | 552 | — | — | 494- 95 | ...... | 4 Pramoda | 4 Âshâḍha | 9803 | 29.409 | 610 | 1.830 |
| 3597 | 418 | 553 | — | — | 495- 96 | ...... | 5 Prajâpati | ...... | ...... | ...... | ...... | ...... |
| 3598 | 419 | 554 | — | — | *496- 97 | ...... | 6 Aṅgiras | ...... | ...... | ...... | ...... | ...... |
| 3599 | 420 | 555 | — | — | 497- 98 | ...... | 7 Śrîmukha | 3 Jyeshṭha | 9982 | 29.946 | 681 | 2.043 |
| 3600 | 421 | 556 | — | — | 498- 99 | ...... | 8 Bhâva | ...... | ...... | ...... | ...... | ...... |
| 3601 | 422 | 557 | — | — | 499-500 | ...... | 9 Yuvan | 7 Âśvina | 9988 | 29.964 | 348 | 1.044 |
| 3602 | 423 | 558 | — | — | *500- 1 | ...... | 10 Dhâtṛi | ...... | ...... | ...... | ...... | ...... |
| 3603 | 424 | 559 | — | — | 501- 2 | ...... | 11 Îśvara | ...... | ...... | ...... | ...... | ...... |
| 3604 | 425 | 560 | — | — | 502- 3 | ...... | 12 Bahudhânya | 4 Âshâḍha | 9336 | 28.008 | 109 | 0.327 |
| 3605 | 426 | 561 | — | — | 503- 4 | ...... | 13 Pramâthin | ...... | ...... | ...... | ...... | ...... |
| 3606 | 427 | 562 | — | — | *504- 5 | ...... | 14 Vikrama | ...... | ...... | ...... | ...... | ...... |
| 3607 | 428 | 563 | — | — | 505- 6 | ...... | 15 Vṛisha | 3 Jyeshṭha | 9487 | 28.461 | 219 | 0.657 |
| 3608 | 429 | 564 | — | — | 506- 7 | ...... | 16 Chitrabhânu | ...... | ...... | ...... | ...... | ...... |
| 3609 | 430 | 565 | — | — | 507- 8 | ...... | 17 Subhânu | 12 Phâlguna | 9983 | 29.949 | 52 | 0.156 |
| 3610 | 431 | 566 | — | — | *508- 9 | ...... | 18 Târaṇa | ...... | ...... | ...... | ...... | ...... |
| 3611 | 432 | 567 | — | — | 509- 10 | ...... | 19 Pârthiva | ...... | ...... | ...... | ...... | ...... |
| 3612 | 433 | 568 | — | — | 510- 11 | ...... | 20 Vyaya | 5 Śrâvaṇa | 9597 | 28.791 | 184 | 0.552 |
| 3613 | 434 | 569 | — | — | 511- 12 | ...... | 21 Sarvajit | ...... | ...... | ...... | ...... | ...... |
| 3614 | 435 | 570 | — | — | *512- 13 | ...... | 22 Sarvadhârin | ...... | ...... | ...... | ...... | ...... |
| 3615 | 436 | 571 | — | — | 513- 14 | ...... | 23 Virodhin | 4 Âshâḍha | 9764 | 29.292 | 635 | 1.905 |
| 3616 | 437 | 572 | — | — | 514- 15 | ...... | 24 Vikṛita | ...... | ...... | ...... | ...... | ...... |
| 3617 | 438 | 573 | — | — | 515- 16 | ...... | 25 Khara | ...... | ...... | ...... | ...... | ...... |
| 3618 | 439 | 574 | — | — | *516- 17 | ...... | 26 Nandana | 2 Vaiśâkha | 9737 | 29.211 | 122 | 0.366 |
| 3619 | 440 | 575 | — | — | 517- 18 | ...... | 27 Vijaya | ...... | ...... | ...... | ...... | ...... |
| 3620 | 441 | 576 | — | — | 518- 19 | ...... | 28 Jaya | 6 Bhâdrapada | 9648 | 28.944 | 78 | 0.234 |
| 3621 | 442 | 577 | — | — | 519- 20 | ...... | 29 Manmatha | ...... | ...... | ...... | ...... | ...... |
| 3622 | 443 | 578 | — | — | *520- 21 | ...... | 30 Durmukha | ...... | ...... | ...... | ...... | ...... |
| 3623 | 444 | 579 | — | — | 521- 22 | ...... | 31 Hemalamba | 4 Âshâḍha | 9310 | 27.930 | 167 | 0.501 |
| 3624 | 445 | 580 | — | — | 522- 23 | ...... | 32 Vilamba | ...... | ...... | ...... | ...... | ...... |
| 3625 | 446 | 581 | — | — | 523- 24 | ...... | 33 Vikârin | ...... | ...... | ...... | ...... | ...... |
| 3626 | 447 | 582 | — | — | *524- 25 | ...... | 34 Śârvarî | 3 Jyeshṭha | 9598 | 28.794 | 229 | 0.687 |
| 3627 | 448 | 583 | — | — | 525- 26 | ...... | 35 Plava | ...... | ...... | ...... | ...... | ...... |

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

| II. ADDED LUNAR MONTHS (continued.) | | | | | III. COMMENCEMENT OF THE | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean. | | | | | Solar year. | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | |
| | Time of the preceding saṅkrânti expressed in | | Time of the succeeding saṅkrânti expressed in | | | (Time of the Mesha saṅkrânti.) | | | | | | | At Sunrise on meridian of Ujjain. | | | | | |
| | | | | | | | By the Ârya Siddhânta. | | | | | | Moon's Age. | | | | | |
| Name of month | Lunation parts (l.) | Tithis | Lunation parts (l.) | Tithis | Day and Month A. D. | Week day | Gh. | Pa. | H. | M. | Day and Month A. D. | Week day. | Lunation parts (l.) elapsed | Tithis elapsed | a. | b. | c. | Kali. |
| 8a | 9a | 10a | 11a | 12a | 13 | 14 | 15 | | 17 | | 19 | 20 | 21 | 22 | 23 | 24* | 25 | 1 |
| 4 Âshâḍha .... | 9073 | 29.920 | 281 | 0.842 | 18 Mar. (77) | 6 Fri | 48 | 32 | 19 | 25 | 22 Feb. (53) | 3 Tues. | 109 | .327 | 22 | 986 | 212 | 3596 |
| .............. | .... | ...... | .... | ....... | 19 Mar. (78) | 1 Sun | 4 | 4 | 1 | 37 | 13 Mar. (72) | 2 Mon. | 96 | .288 | 57 | 872 | 263 | 3597 |
| 12 Phâlguna... | 9809 | 29.426 | 116 | 0.348 | 18 Mar. (78) | 2 Mon | 19 | 35 | 7 | 50 | 2 Mar. (62) | 0 Sat. | 271 | .813 | 271 | 756 | 235 | 3598 |
| .............. | .... | ...... | .... | ....... | 18 Mar. (77) | 3 Tues | 35 | 6 | 14 | 2 | 19 Feb. (50) | 4 Wed. | 206 | .618 | 147 | 603 | 204 | 3599 |
| .............. | .... | ...... | .... | ....... | 18 Mar. (77) | 4 Wed. | 50 | 37 | 20 | 15 | 10 Mar. (69) | 3 Tues. | 287 | .861 | 181 | 539 | 255 | 3600 |
| 9 Mârgaśîrsha . | 9951 | 29.854 | 259 | 0.777 | 19 Mar. (78) | 6 Fri. | 6 | 0 | 2 | 27 | 27 Feb. (58) | 0 Sat. | 269 | .807 | 57 | 386 | 225 | 3601 |
| .............. | .... | ...... | .... | ....... | 18 Mar. (78) | 0 Sat. | 21 | 40 | 8 | 40 | 16 Mar. (76) | 5 Thur. | 29 | .087 | 9753 | 286 | 273 | 3602 |
| .............. | .... | ...... | .... | ....... | 18 Mar. (77) | 1 Sun | 37 | 11 | 14 | 52 | 6 Mar. (65) | 3 Tues. | 229 | .687 | 9967 | 169 | 245 | 3603 |
| 5 Śrâvana.... | 9787 | 29.361 | 94 | 0.283 | 18 Mar. (77) | 2 Mon | 52 | 42 | 21 | 5 | 23 Feb. (54) | 0 Sat. | ⊙ −4 | −.012 | 9843 | 16 | 214 | 3604 |
| .............. | .... | ...... | .... | ....... | 19 Mar. (78) | 4 Wed | 8 | 14 | 3 | 17 | 14 Mar (73) | 6 Fri. | ⊙ −[illegible] | −.0[illegible] | 9878 | 952 | 265 | 3605 |
| .............. | .... | ...... | .... | ....... | 18 Mar. (78) | 5 Thur. | 23 | 45 | 9 | 30 | 3 Mar. (63) | 4 Wed. | 112 | .336 | 92 | 836 | 237 | 3606 |
| 2 Vaiśâkha ... | 9930 | 29.789 | 237 | 0.711 | 18 Mar. (77) | 6 Fri. | 39 | 16 | 15 | 42 | 21 Feb. (52) | 2 Mon. | 311 | .933 | 306 | 719 | 209 | 3607 |
| .............. | .... | ...... | .... | ....... | 18 Mar. (77) | 0 Sat. | 54 | 47 | 21 | 55 | 11 Mar. (70) | 0 Sat. | 47 | .141 | 2 | 619 | 258 | 3608 |
| 10 Pausha.... | 9765 | 29.295 | 72 | 0.217 | 19 Mar. (78) | 2 Mon. | 10 | 19 | 4 | 7 | 28 Feb. (59) | 4 Wed. | 48 | .144 | 9878 | 466 | 227 | 3609 |
| .............. | .... | ...... | .... | ....... | 18 Mar. (78) | 3 Tues | 25 | 50 | 10 | 20 | 18 Mar. (78) | 3 Tues. | 135 | .405 | 9912 | 402 | 278 | 3610 |
| .............. | .... | ...... | .... | ....... | 18 Mar. (77) | 4 Wed. | 41 | 21 | 16 | 32 | 7 Mar. (66) | 0 Sat. | 68 | .204 | 9788 | 249 | 245 | 3611 |
| 7 Âśvina ..... | 9908 | 29.724 | 215 | 0.646 | 18 Mar. (77) | 5 Thur. | 56 | 52 | 22 | 45 | 25 Feb. (56) | 5 Thur | 248 | .744 | 3 | 133 | 219 | 3612 |
| .............. | .... | ...... | .... | ....... | 19 Mar. (78) | 0 Sat | 12 | 24 | 4 | 57 | 16 Mar. (75) | 4 Wed. | 236 | .708 | 37 | 69 | 271 | 3613 |
| .............. | .... | ...... | .... | ....... | 18 Mar. (78) | 1 Sun. | 27 | 55 | 11 | 10 | 4 Mar (64) | 1 Sun. | ⊙ −18 | −.054 | 9913 | 916 | 240 | 3614 |
| 3 Jyeshṭha.... | 9743 | 29.230 | 51 | 0.152 | 18 Mar. (77) | 2 Mon. | 43 | 26 | 17 | 22 | 22 Feb. (53) | 6 Fri. | 137 | .411 | 128 | 799 | 212 | 3615 |
| .............. | .... | ...... | .... | ....... | 18 Mar. (77) | 3 Tues | 58 | 57 | 23 | 35 | 13 Mar. (72) | 5 Thur. | 162 | .486 | 162 | 736 | 263 | 3616 |
| 12 Phâlguna... | 9886 | 29.658 | 193 | 0.580 | 19 Mar. (78) | 5 Thur. | 14 | 29 | 5 | 47 | 2 Mar (61) | 2 Mon. | 108 | .324 | 38 | 583 | 232 | 3617 |
| .............. | .... | ...... | .... | ....... | 18 Mar. (78) | 6 Fri. | 30 | 0 | 12 | 0 | 19 Feb. (50) | 6 Fri. | 116 | .348 | 9913 | 430 | 201 | 3618 |
| .............. | .... | ...... | .... | ....... | 18 Mar. (77) | 0 Sat | 45 | 31 | 18 | 12 | 9 Mar. (68) | 5 Thur. | 192 | .576 | 9948 | 366 | 253 | 3619 |
| 8 Kârttika... | 9721 | 29.164 | 29 | 0.086 | 19 Mar. (78) | 2 Mon | 1 | 2 | 0 | 25 | 26 Feb. (57) | 2 Mon. | 101 | .303 | 9824 | 213 | 222 | 3620 |
| .............. | .... | ...... | .... | ....... | 19 Mar. (78) | 3 Tues | 16 | 34 | 6 | 37 | 17 Mar. (76) | 1 Sun. | 110 | .330 | 9858 | 149 | 273 | 3621 |
| .............. | .... | ...... | .... | ....... | 18 Mar. (78) | 4 Wed. | 32 | 5 | 12 | 50 | 6 Mar. (66) | 6 Fri. | 242 | .726 | 73 | 33 | 245 | 3622 |
| 5 Śrâvana .... | 9864 | 29.593 | 172 | 0.515 | 18 Mar. (77) | 5 Thur. | 47 | 36 | 19 | 2 | 23 Feb. (54) | 3 Tues. | ⊙ −5 | −.015 | 9949 | 880 | 214 | 3623 |
| .............. | .... | ...... | .... | ....... | 19 Mar. (78) | 0 Sat. | 3 | 7 | 1 | 15 | 14 Mar. (73) | 2 Mon | ⊙ −[illegible] | −.01[illegible] | 9983 | 816 | 266 | 3624 |
| .............. | .... | ...... | .... | ....... | 19 Mar. (78) | 1 Sun. | 18 | 39 | 7 | 27 | 4 Mar. (63) | 0 Sat. | 204 | .612 | 197 | 699 | 238 | 3625 |
| 1 Chaitra..... | 9700 | 29.099 | 7 | 0.021 | 18 Mar. (78) | 2 Mon. | 34 | 10 | 13 | 40 | 21 Feb. (52) | 4 Wed. | 174 | .522 | 73 | 547 | 207 | 3626 |
| .............. | .... | ...... | .... | ....... | 18 Mar. (77) | 3 Tues | 49 | 41 | 19 | 52 | 11 Mar. (70) | 3 Tues. | 264 | .792 | 108 | 483 | 258 | 3627 |

* ⊙ See Text, Art. 101, para. 2.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara | | True. | | | | |
| Kali. | Śaka. | Chaitrâdi Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | (Southern.) | Bṛihaspati cycle (Northern) current at Mesha saṅkrânti. | Name of month. | Time of the preceding saṅkrânti expressed in Lunation parts. (t.) | Time of the preceding saṅkrânti expressed in Tithis. | Time of the succeeding saṅkrânti expressed in Lunation parts. (t.) | Time of the succeeding saṅkrânti expressed in Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 3628 | 449 | 584 | — | — | 526-27 | 36 Śubhakṛit | | 8 Kârttika<br>10 *Pausha (Ksh.)*<br>12 Phâlguna | 9878<br>15<br>9998 | 29.634<br>0.045<br>29.994 | 18<br>9998<br>126 | 0.054<br>29.994<br>0.378 |
| 3629 | 450 | 585 | — | — | 527-28 | 37 Śobhana | | | | | | |
| 3630 | 451 | 586 | — | — | *528-29 | 38 Krodhin | | | | | | |
| 3631 | 452 | 587 | — | — | 529-30 | 39 Viśvâvasu | | 5 Śrâvaṇa | 9691 | 29.073 | 364 | 1.092 |
| 3632 | 453 | 588 | — | — | 530-31 | 40 Parâbhava | | | | | | |
| 3633 | 454 | 589 | — | — | 531-32 | 41 Plavaṅga | | | | | | |
| 3634 | 455 | 590 | — | — | *532-33 | 42 Kîlaka | | 4 Âshâḍha | 9747 | 29.241 | 596 | 1.788 |
| 3635 | 456 | 591 | — | — | 533-34 | 43 Saumya | | | | | | |
| 3636 | 457 | 592 | — | — | 534-35 | 44 Sâdhâraṇa | | | | | | |
| 3637 | 458 | 593 | — | — | 535-36 | 45 Virodhakṛit | | 2 Vaiśâkha | 9909 | 29.727 | 320 | 0.960 |
| 3638 | 459 | 594 | — | — | *536-37 | 46 Paridhâvin | | | | | | |
| 3639 | 460 | 595 | — | — | 537-38 | 47 Pramâdin | | 6 Bhâdrapada | 9844 | 29.532 | 260 | 0.780 |
| 3640 | 461 | 596 | — | — | 538-39 | 48 Ânanda | | | | | | |
| 3641 | 462 | 597 | — | — | 539-40 | 49 Râkshasa | | | | | | |
| 3642 | 463 | 598 | — | — | *540-41 | 50 Anala | | 4 Âshâḍha | 9877 | 29.631 | 146 | 0.438 |
| 3643 | 464 | 599 | — | — | 541-42 | 51 Piṅgala | | | | | | |
| 3644 | 465 | 600 | — | — | 542-43 | 52 Kâlayukta | | | | | | |
| 3645 | 466 | 601 | — | — | 543-44 | 53 Siddhârthin | | 3 Jyeshṭha | 9784 | 29.352 | 340 | 1.020 |
| 3646 | 467 | 602 | — | — | *544-45 | 54 Raudra | | | | | | |
| 3647 | 468 | 603 | — | — | 545-46 | 55 Durmati | | 8 Kârttika<br>10 *Pausha (Ksh.)*<br>12 Phâlguna | 9965<br>30<br>9958 | 29.895<br>0.090<br>29.874 | 55<br>9961<br>110 | 0.165<br>29.883<br>0.330 |
| 3648 | 469 | 604 | — | — | 546-47 | 56 Dundubhi | | | | | | |
| 3649 | 470 | 605 | — | — | 547-48 | 57 Rudhirodgârin | | | | | | |
| 3650 | 471 | 606 | — | — | *548-49 | 58 Raktâksha | | 5 Śrâvaṇa | 9690 | 29.070 | 457 | 1.371 |
| 3651 | 472 | 607 | — | — | 549-50 | 59 Krodhana | | | | | | |
| 3652 | 473 | 608 | — | — | 550-51 | 60 Kshaya | | | | | | |
| 3653 | 474 | 609 | — | — | 551-52 | 1 Prabhava | | 4 Âshâḍha | 9824 | 29.472 | 577 | 1.731 |
| 3654 | 475 | 610 | — | — | *552-53 | 2 Vibhava | | | | | | |
| 3655 | 476 | 611 | — | — | 553-54 | 3 Śukla | | | | | | |
| 3656 | 477 | 612 | — | — | 554-55 | 4 Pramoda | | 2 Vaiśâkha | 9990 | 29.970 | 482 | 1.446 |

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

| II. ADDED LUNAR MONTHS (continued.) | | | | | III. COMMENCEMENT OF THE | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean. | | | | | Solar year | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | Kali. |
| Name of month | Time of the preceding saṅkrānti expressed in | | Time of the succeeding saṅkrānti expressed in | | Day and Month A. D. | (Time of the Mesha saṅkrānti.) | | | | | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. | | | | | |
| | Lunation parts (t.) | Tithis. | Lunation parts (t.) | Tithis. | | Week day. | By the Ārya Siddhānta | | | | | | Moon's Age. | | | | | |
| | | | | | | | Gh. | Pa. | H. | M. | | | Lunat. parts elapsed (t.) | Tithis elapsed | a. | b. | c. | |
| 8a | 9a | 10a | 11a | 12a | 13 | 14 | 15 | | 17 | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 10 Pausha..... | 9842 | 29.527 | 150 | 0.449 | 19 Mar. (78) | 5 Thur. | 5 | 12 | 2 | 5 | 26 Feb. (59) | 0 Sat. | 247 | .741 | 9984 | 330 | 227 | 3628 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 6 Fri. | 20 | 44 | 8 | 17 | 19 Mar. (78) | 6 Fri. | 298 | .894 | 15 | 266 | 276 | 3629 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 0 Sat. | 36 | 15 | 14 | 30 | 7 Mar. (67) | 3 Tues. | 126 | .378 | 9894 | 113 | 248 | 3630 |
| 7 Āśvina...... | 9965 | 29.955 | 293 | 0.877 | 18 Mar. (77) | 1 Sun. | 51 | 46 | 20 | 42 | 26 Feb. (56) | 1 Sun. | 245 | .735 | 108 | 996 | 220 | 3631 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 3 Tues. | 7 | 17 | 2 | 55 | 16 Mar. (75) | 0 Sat. | 225 | .675 | 148 | 932 | 271 | 3632 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 4 Wed. | 22 | 49 | 9 | 7 | 5 Mar. (64) | 4 Wed. | 22 | .066 | 10 | 780 | 240 | 3633 |
| 3 Jyeshṭha.... | 9821 | 29.462 | 128 | 0.384 | 19 Mar. (78) | 5 Thur. | 38 | 20 | 15 | 20 | 23 Feb. (54) | 2 Mon. | 256 | .768 | 283 | 683 | 212 | 3634 |
| .............. | .... | ........ | | ....... | 18 Mar. (77) | 6 Fri. | 53 | 51 | 21 | 32 | 12 Mar. (71) | 0 Sat. | 15 | .045 | 9929 | 563 | 261 | 3635 |
| 12 Phālguna.... | 9963 | 29.890 | 271 | 0.812 | 19 Mar. (78) | 1 Sun. | 9 | 22 | 3 | 45 | 2 Mar. (61) | 5 Thur. | 330 | .990 | 143 | 440 | 232 | 3636 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 2 Mon. | 24 | 54 | 9 | 57 | 19 Feb. (50) | 2 Mon. | 297 | .891 | 19 | 293 | 202 | 3637 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 3 Tues. | 40 | 25 | 16 | 10 | 9 Mar. (69) | 1 Sun. | 333 | .999 | 54 | 230 | 253 | 3638 |
| 8 Kārttika... | 9709 | 29.396 | 106 | 0.318 | 18 Mar. (77) | 4 Wed. | 55 | 56 | 22 | 22 | 26 Feb. (57) | 5 Thur. | 136 | .408 | 9980 | 77 | 222 | 3639 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 6 Fri. | 11 | 27 | 4 | 35 | 17 Mar. (76) | 4 Wed. | 116 | .348 | 9964 | 13 | 273 | 3640 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 0 Sat. | 26 | 59 | 10 | 47 | 7 Mar. (66) | 2 Mon. | 232 | .696 | 178 | 890 | 245 | 3641 |
| 5 Śrāvaṇa.... | 9941 | 29.824 | 249 | 0.746 | 18 Mar. (78) | 1 Sun. | 42 | 30 | 17 | 0 | 24 Feb. (55) | 6 Fri. | 56 | .168 | 54 | 743 | 215 | 3642 |
| .............. | .... | ........ | .... | ....... | 18 Mar. (77) | 2 Mon. | 58 | 1 | 23 | 12 | 14 Mar. (73) | 5 Thur. | 102 | .306 | 89 | 679 | 266 | 3643 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 4 Wed. | 13 | 32 | 5 | 25 | 3 Mar. (62) | 2 Mon. | 81 | .243 | 9905 | 527 | 235 | 3644 |
| 1 Chaitra..... | 9777 | 29.331 | 84 | 0.253 | 19 Mar. (78) | 5 Thur. | 29 | 4 | 11 | 37 | 20 Feb. (51) | 6 Fri. | 83 | .249 | 9640 | 374 | 204 | 3645 |
| .............. | .... | ........ | .... | ....... | 18 Mar. (78) | 6 Fri. | 44 | 35 | 17 | 50 | 10 Mar. (70) | 5 Thur. | 145 | .435 | 9875 | 310 | 256 | 3646 |
| 10 Pausha.... | 9920 | 29.759 | 227 | 0.681 | 19 Mar. (78) | 1 Sun. | 0 | 6 | 0 | 2 | 27 Feb. (58) | 2 Mon. | 8 | .024 | 9751 | 157 | 225 | 3647 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 2 Mon. | 15 | 37 | 6 | 15 | 18 Mar. (77) | 1 Sun. | 3 | .009 | 9785 | 93 | 276 | 3648 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 3 Tues. | 31 | 9 | 12 | 27 | 8 Mar. (67) | 6 Fri. | 119 | .357 | 0 | 978 | 248 | 3649 |
| 6 Bhādrapada. | 9755 | 29.265 | 62 | 0.187 | 18 Mar. (78) | 4 Wed. | 46 | 40 | 18 | 40 | 26 Feb. (57) | 4 Wed. | 247 | .741 | 214 | 800 | 220 | 3650 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 6 Fri. | 2 | 11 | 0 | 52 | 16 Mar. (75) | 3 Tues. | 255 | .765 | 249 | 796 | 271 | 3651 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 0 Sat. | 17 | 42 | 7 | 5 | 5 Mar. (64) | 0 Sat. | 155 | .465 | 124 | 643 | 240 | 3652 |
| 3 Jyeshṭha.... | 9898 | 29.693 | 205 | 0.615 | 19 Mar. (78) | 1 Sun. | 33 | 14 | 13 | 17 | 22 Feb. (53) | 4 Wed. | 151 | .453 | 0 | 490 | 209 | 3653 |
| .............. | .... | ........ | .... | ....... | 18 Mar. (78) | 2 Mon. | 48 | 45 | 19 | 30 | 12 Mar. (72) | 3 Tues. | 237 | .711 | 35 | 426 | 261 | 3654 |
| 11 Māgha..... | 9733 | 29.200 | 41 | 0.122 | 19 Mar. (78) | 4 Wed. | 4 | 16 | 1 | 42 | 1 Mar. (60) | 0 Sat. | 128 | .384 | 9916 | 274 | 230 | 3655 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 5 Thur. | 19 | 47 | 7 | 55 | 18 Feb. (49) | 4 Wed. | 26 | .078 | 9786 | 121 | 199 | 3656 |

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara | | True | | | | |
| Kali. | Śaka. | Chaitrâdi Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | (Southern.) | Bṛihaspati cycle (Northern) current at Mesha saṅkrânti | Name of month. | Time of the preceding saṅkrânti expressed in: Lunation parts. (t.) | Tithis. | Time of the succeeding saṅkrânti expressed in: Lunation parts. (t.) | Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 3657 | 478 | 613 | — | — | 555–56 | ....... 5 Prajâpati ........... | | ........... | ...... | ...... | ...... | ...... |
| 3658 | 479 | 614 | — | — | *556–57 | ....... 6 Aṅgiras............. | | 6 Bhâdrapada.. | 9970 | 29.910 | 448 | 1.344 |
| 3659 | 480 | 615 | — | — | 557–58 | ....... 7 Śrîmukha........... | | ........... | ...... | ...... | ...... | ...... |
| 3660 | 481 | 616 | — | — | 558–59 | ....... 8 Bhâva............... | | ........... | ...... | ...... | ...... | ...... |
| 3661 | 482 | 617 | — | — | 559–60 | ....... 9 Yuvan............... | | 4 Âshâḍha .... | 9320 | 27.960 | 108 | 0.324 |
| 3662 | 483 | 618 | — | — | *560–61 | ....... 10 Dhâtṛi............. | | ........... | ...... | ...... | ...... | ...... |
| 3663 | 484 | 619 | — | — | 561–62 | ....... 11 Îśvara.............. | | ........... | ...... | ...... | ...... | ...... |
| 3664 | 485 | 620 | — | — | 562–63 | ....... 12 Bahudhânya......... | | 3 Jyeshṭha .... | 9967 | 29.901 | 527 | 1.581 |
| 3665 | 486 | 621 | — | — | 563–64 | ....... 13 Pramâthin.......... | | ........... | ...... | ...... | ...... | ...... |
| 3666 | 487 | 622 | — | — | *564–65 | ....... 14 Vikrama............. | | 7 Âśvina......<br>10 Pausha (Ksh.)<br>12 Phâlguna. .. | 9921<br>104<br>9945 | 29.763<br>0.312<br>29.844 | 140<br>9989<br>70 | 0.420<br>29 967<br>0.210 |
| 3667 | 488 | 623 | — | — | 565–66 | ....... 15 Vṛisha........... | | ........... | ...... | ...... | ...... | ...... |
| 3668 | 489 | 624 | — | — | 566–67 | ....... 16 Chitrabhânu....... | | ........... | ...... | ...... | ...... | ...... |
| 3669 | 490 | 625 | — | — | 567–68 | ....... 17 Subhânu [1]....... | | 5 Śrâvaṇa .... | 9648 | 28.944 | 455 | 1.365 |
| 3670 | 491 | 626 | — | — | *568–69 | ....... 19 Pârthiva.. ....... | | ........... | ...... | ...... | ...... | ...... |
| 3671 | 492 | 627 | — | — | 569–70 | ....... 20 Vyaya............. | | ........... | ...... | ...... | ...... | ...... |
| 3672 | 493 | 628 | — | — | 570–71 | ....... 21 Sarvajit........... | | 4 Âshâḍha ... | 9993 | 29.979 | 648 | 1.944 |
| 3673 | 494 | 629 | — | — | 571–72 | ....... 22 Sarvadhârin........ | | ........... | ...... | ...... | ...... | ...... |
| 3674 | 495 | 630 | — | — | *572–73 | ....... 23 Virodhin........... | | ........... | ...... | ...... | ...... | ...... |
| 3675 | 496 | 631 | — | — | 573–74 | ....... 24 Vikṛita............ | | 2 Vaiśâkha.... | 9980 | 29.940 | 551 | 1.653 |
| 3676 | 497 | 632 | — | — | 574–75 | ....... 25 Khara.............. | | ........... | ...... | ...... | ...... | ...... |
| 3677 | 498 | 633 | — | — | 575–76 | ....... 26 Nandana............ | | 6 Bhâdrapada.. | 9997 | 29.991 | 567 | 1.701 |
| 3678 | 499 | 634 | — | — | *576–77 | ....... 27 Vijaya............. | | ........... | ...... | ...... | ...... | ...... |
| 3679 | 500 | 635 | — | — | 577–78 | ....... 28 Jaya............... | | ........... | ...... | ...... | ...... | ...... |
| 3680 | 501 | 636 | — | — | 578–79 | ....... 29 Manmatha........... | | 4 Âshâḍha .... | 9462 | 28.386 | 144 | 0.432 |
| 3681 | 502 | 637 | — | — | 579–80 | ....... 30 Durmukha........... | | ........... | ...... | ...... | ...... | ...... |
| 3682 | 503 | 638 | — | — | *580–81 | ....... 31 Hemalamba.......... | | ........... | ...... | ...... | ...... | ...... |
| 3683 | 504 | 639 | — | — | 581–82 | ....... 32 Vilamba............ | | 2 Vaiśâkha.... | 9522 | 28.566 | 71 | 0.213 |
| 3684 | 505 | 640 | — | — | 582–83 | ....... 33 Vikârin............ | | ........... | ...... | ...... | ...... | ...... |
| 3685 | 506 | 641 | — | — | 583–84 | ....... 34 Śârvari............ | | 6 Bhâdrapada. | 9530 | 28.590 | 71 | 0.213 |
| 3686 | 507 | 642 | — | — | *584–85 | ....... 35 Plava.............. | | ........... | ...... | ...... | ...... | ...... |
| 3687 | 508 | 643 | — | — | 585–86 | ....... 36 Śubhakṛit.......... | | ........... | ...... | ...... | ...... | ...... |

[1] Târaṇa, No. 18, was suppressed.

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

| II. ADDED LUNAR MONTHS (*continued.*) | | | | | III. COMMENCEMENT OF THE | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean. | | | | | Solar year. | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | |
| | Time of the preceding saṅkrânti expressed in | | Time of the succeeding saṅkrânti expressed in | | | (Time of the Mesha saṅkrânti.) | | | | | At Sunrise on meridian of Ujjain. | | | | | |
| | | | | | | | By the Ârya Siddhânta. | | | | Moon's Age. | | | | | |
| Name of month. | Lunation parts. (*t.*) | Tithis. | Lunation parts. (*t.*) | Tithis. | Day and Month A. D. | Week day. | Gh. Pa. | H. M. | Day and Month A. D. | Week day. | Lunat. parts elapsed. (*t.*) | Tithis elapsed. | *a.* | *b.* | *c.* | Kali. |
| 8a | 9a | 10a | 11a | 12a | 13 | 14 | 16 | 17 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 6 Fri. | 35 19 | 14 7 | 9 Mar. (68) | 3 Tues. | 11 | .033 | 9821 | 57 | 250 | 3657 |
| 8 Kârttika.... | 9876 | 29.628 | 183 | 0.550 | 19 Mar. (78) | 0 Sat. | 50 50 | 20 20 | 27 Feb. (58) | 1 Sun. | 124 | .372 | 35 | 940 | 222 | 3658 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 2 Mon. | 6 21 | 2 32 | 17 Mar. (76) | 0 Sat. | 112 | .336 | 70 | 876 | 274 | 3659 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 3 Tues. | 21 52 | 8 45 | 7 Mar. (66) | 5 Thur. | 284 | .852 | 284 | 760 | 246 | 3660 |
| 4 Âshâḍha.... | 9711 | 29.134 | 19 | 0.056 | 19 Mar. (78) | 4 Wed. | 37 24 | 14 57 | 24 Feb. (55) | 2 Mon. | 214 | .642 | 160 | 607 | 215 | 3661 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 5 Thur. | 52 55 | 21 10 | 14 Mar. (74) | 1 Sun. | 296 | .888 | 194 | 543 | 266 | 3662 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 0 Sat. | 8 26 | 3 22 | 3 Mar. (62) | 5 Thur. | 300 | .900 | 70 | 390 | 235 | 3663 |
| 1 Chaitra..... | 9854 | 29.562 | 161 | 0.484 | 19 Mar. (78) | 1 Sun. | 23 57 | 9 35 | 20 Feb. (51) | 2 Mon. | 229 | .687 | 9946 | 237 | 205 | 3664 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 2 Mon. | 39 29 | 15 47 | 11 Mar. (70) | 1 Sun. | 245 | .735 | 9981 | 173 | 256 | 3665 |
| 10 Pausha..... | 9997 | 29.991 | 304 | 0.913 | 19 Mar. (78) | 3 Tues. | 55 0 | 22 0 | 28 Feb. (59) | 5 Thur. | 16 | .048 | 9856 | 21 | 225 | 3666 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 5 Thur. | 10 31 | 4 12 | 18 Mar. (77) | 4 Wed. | ⊙ −6 | −.018 | 9891 | 957 | 276 | 3667 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 6 Fri. | 26 2 | 10 25 | 8 Mar. (67) | 2 Mon. | 127 | .381 | 105 | 840 | 248 | 3668 |
| 6 Bhâdrapada . | 9832 | 29.497 | 140 | 0.419 | 19 Mar. (78) | 0 Sat. | 41 34 | 16 37 | 26 Feb. (57) | 0 Sat. | 322 | .966 | 819 | 723 | 220 | 3669 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 1 Sun. | 57 5 | 22 50 | 15 Mar. (75) | 5 Thur. | 58 | .174 | 16 | 623 | 269 | 3670 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 3 Tues. | 12 36 | 5 2 | 4 Mar. (63) | 2 Mon. | 57 | .171 | 9891 | 470 | 238 | 3671 |
| 3 Jyeshṭha.... | 9975 | 29.925 | 282 | 0.847 | 19 Mar. (78) | 4 Wed. | 28 7 | 11 15 | 21 Feb. (52) | 6 Fri. | 37 | .111 | 9767 | 318 | 207 | 3672 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 5 Thur. | 43 39 | 17 27 | 12 Mar. (71) | 5 Thur. | 82 | .246 | 9802 | 254 | 258 | 3673 |
| 11 Mâgha...... | 9810 | 29.431 | 118 | 0.354 | 19 Mar. (78) | 6 Fri. | 59 10 | 23 40 | 1 Mar. (61) | 3 Tues. | 262 | .786 | 16 | 137 | 230 | 3674 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 1 Sun. | 14 41 | 5 52 | 18 Feb. (49) | 0 Sat. | 21 | .063 | 9892 | 984 | 199 | 3675 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 2 Mon. | 30 12 | 12 5 | 9 Mar. (68) | 6 Fri. | ⊙ −3 | −.009 | 9926 | 920 | 251 | 3676 |
| 8 Kârttika.... | 9953 | 29.860 | 261 | 0.782 | 19 Mar. (78) | 3 Tues. | 45 44 | 18 17 | 27 Feb. (58) | 4 Wed. | 150 | .450 | 141 | 804 | 223 | 3677 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (79) | 5 Thur. | 1 15 | 0 30 | 17 Mar. (77) | 3 Tues. | 175 | .525 | 175 | 740 | 274 | 3678 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 6 Fri. | 16 46 | 6 42 | 6 Mar. (65) | 0 Sat. | 118 | .354 | 51 | 587 | 243 | 3679 |
| 4 Âshâḍha.... | 9789 | 29.366 | 96 | 0.288 | 19 Mar. (78) | 0 Sat. | 32 17 | 12 55 | 23 Feb. (54) | 4 Wed. | 126 | .378 | 9927 | 434 | 212 | 3680 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 1 Sun. | 47 49 | 19 7 | 14 Mar. (73) | 3 Tues. | 203 | .609 | 9961 | 370 | 264 | 3681 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (79) | 3 Tues. | 3 20 | 1 20 | 2 Mar. (62) | 0 Sat. | 114 | .342 | 9837 | 218 | 233 | 3682 |
| 1 Chaitra..... | 9931 | 29.794 | 239 | 0.716 | 19 Mar. (78) | 4 Wed. | 18 51 | 7 32 | 20 Feb. (51) | 5 Thur. | 278 | .834 | 61 | 101 | 205 | 3683 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 5 Thur. | 34 22 | 13 45 | 11 Mar. (70) | 4 Wed. | 258 | .774 | 86 | 37 | 256 | 3684 |
| 9 Mârgaśîrsha . | 9767 | 29.300 | 74 | 0.223 | 19 Mar. (78) | 6 Fri. | 49 54 | 19 57 | 28 Feb. (59) | 1 Sun. | 9 | .027 | 9962 | 884 | 225 | 3685 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (79) | 1 Sun. | 5 25 | 2 10 | 18 Mar. (78) | 0 Sat. | 10 | .030 | 9996 | 820 | 277 | 3686 |
| .............. | .... | ........ | .... | ....... | 19 Mar. (78) | 2 Mon. | 20 56 | 8 22 | 8 Mar. (67) | 5 Thur. | 217 | .651 | 211 | 704 | 248 | 3687 |

⊙ See Text Art. 101 above, para. 2

# TABLE I.

*Lunation-parts* = 10,000*ths of a circle.* *A tithi* = 1/30*th of the moon's synodic revolution.*

| I. CONCURRENT YEAR | | | | | | | | II. ADDED LUNAR MONTHS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara | | True | | | | |
| Kali. | Śaka. | Chaitrâdi. Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | (Southern.) | Brihaspati cycle (Northern) current at Mesha saṅkrânti | Name of month | Time of the preceding saṅkrânti expressed in: Lunation parts (*l.*) | Time of the preceding saṅkrânti expressed in: Tithis. | Time of the succeeding saṅkrânti expressed in: Lunation parts (*l.*) | Time of the succeeding saṅkrânti expressed in: Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 3688 | 509 | 644 | — | — | 586- 87 | 37 Śobhana | | 5 Śrâvana | 9654 | 28.962 | 416 | 1.248 |
| 3689 | 510 | 645 | — | — | 587- 88 | 38 Krodhin | | | | | | |
| 3690 | 511 | 646 | — | — | *588- 89 | 39 Viśvâvasu | | | | | | |
| 3691 | 512 | 647 | — | — | 589- 90 | 40 Parâbhava | | 3 Jyeshtha | 9581 | 28.743 | 189 | 0.567 |
| 3692 | 513 | 648 | — | — | 590- 91 | 41 Plavanga | | | | | | |
| 3693 | 514 | 649 | — | — | 591- 92 | 42 Kîlaka | | | | | | |
| 3694 | 515 | 650 | — | — | *592- 93 | 43 Saumya | | 2 Vaiśâkha | 9938 | 29.814 | 527 | 1.581 |
| 3695 | 516 | 651 | — | — | 593- 94 | 44 Sâdhârana | | | | | | |
| 3696 | 517 | 652 | 1 | — | 594- 95 | 45 Virodhakrit | | 6 Bhâdrapada | 9960 | 29.880 | 584 | 1.752 |
| 3697 | 518 | 653 | 2 | — | 595- 96 | 46 Paridhâvin | | | | | | |
| 3698 | 519 | 654 | 3 | — | *596- 97 | 47 Pramâdin | | | | | | |
| 3699 | 520 | 655 | 4 | — | 597- 98 | 48 Ânanda | | 4 Âshâḍha | 9679 | 29.037 | 281 | 0.843 |
| 3700 | 521 | 656 | 5 | — | 598- 99 | 49 Râkshasa | | | | | | |
| 3701 | 522 | 657 | 6 | — | 599-600 | 50 Anala | | | | | | |
| 3702 | 523 | 658 | 7 | — | *600- 1 | 51 Pingala | | 2 Vaiśâkha | 9482 | 28.446 | 76 | 0.228 |
| 3703 | 524 | 659 | 8 | — | 601- 2 | 52 Kâlayukta | | | | | | |
| 3704 | 525 | 660 | 9 | — | 602- 3 | 53 Siddhârthin | | 6 Bhâdrapada | 9506 | 28.518 | 119 | 0.357 |
| 3705 | 526 | 661 | 10 | — | 603- 4 | 54 Raudra | | | | | | |
| 3706 | 527 | 662 | 11 | — | *604- 5 | 55 Durmati | | | | | | |
| 3707 | 528 | 663 | 12 | — | 605- 6 | 56 Dundubhi | | 5 Śrâvana | 9759 | 29.277 | 418 | 1.254 |
| 3708 | 529 | 664 | 13 | — | 606- 7 | 57 Rudhirodgârin | | | | | | |
| 3709 | 530 | 665 | 14 | — | 607- 8 | 58 Raktâksha | | | | | | |
| 3710 | 531 | 666 | 15 | — | *608- 9 | 59 Krodhana | | 3 Jyeshtha | 9613 | 28.839 | 323 | 0.969 |
| 3711 | 532 | 667 | 16 | — | 609- 10 | 60 Kshaya | | | | | | |
| 3712 | 533 | 668 | 17 | — | 610- 11 | 1 Prabhava | | 8 Kârttika | 9960 | 29.880 | 30 | 0.090 |
| | | | | | | | | 9 *Mârgaś. (Ksh.)* | 30 | 0.090 | 9937 | 29.811 |
| 3713 | 534 | 669 | 18 | — | 611- 12 | 2 Vibhava | | 2 Vaiśâkha | 9954 | 29.862 | 492 | 1.476 |
| 3714 | 535 | 670 | 19 | — | *612- 13 | 3 Śukla | | | | | | |
| 3715 | 536 | 671 | 20 | — | 613- 14 | 4 Pramoda | | 6 Bhâdrapada | 9940 | 29.820 | 545 | 1.635 |
| 3716 | 537 | 672 | 21 | — | 614- 15 | 5 Prajâpati | | | | | | |
| 3717 | 538 | 673 | 22 | — | 615- 16 | 6 Aṅgiras | | | | | | |
| 3718 | 539 | 674 | 23 | — | *616- 17 | 7 Śrîmukha | | 4 Âshâḍha | 9819 | 29.457 | 476 | 1.428 |
| 3719 | 540 | 675 | 24 | — | 617- 18 | 8 Bhâva | | | | | | |

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

| II. ADDED LUNAR MONTHS (*continued.*) | | | | | III. COMMENCEMENT OF THE | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean. | | | | | Solar year | | | | | | Luni-Solar year. (Civil day of Chaitra Sukla 1st.) | | | | | | | Kali. |
| Name of month. | Time of the preceding sankranti expressed in | | Time of the succeeding sankranti expressed in | | Day and Month A. D. | (Time of the Mesha sankranti.) | | | | | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain | | | | | |
| | | | | | | Week day. | By the Ârya Siddhânta | | | | | | Moon's Age | | a. | b. | c. | |
| | Lunation parts (*t*) | Tithis. | Lunation parts (*t*) | Tithis. | | | Gh. | Pa. | H. | M. | | | Lunar parts elapsed (*t*) | Tithis elapsed | | | | |
| 8a | 9a | 10a | 11a | 12a | 13 | 14 | 15 | | 17 | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 6 Bhâdrapada . | 9910 | 29.729 | 217 | 0.651 | 19 Mar. (78) | 3 Tues. | 36 | 27 | 14 | 35 | 25 Feb. (56) | 2 Mon. | 183 | .549 | 87 | 551 | 218 | 3688 |
| ........ | ... | ..... | ... | ..... | 19 Mar. (78) | 4 Wed. | 51 | 59 | 20 | 47 | 16 Mar. (75) | 1 Sun. | 273 | .819 | 121 | 487 | 269 | 3689 |
| ........ | ... | ..... | ... | ..... | 19 Mar. (79) | 6 Fri. | 7 | 30 | 3 | 0 | 4 Mar. (64) | 5 Thur. | 258 | .774 | 9997 | 334 | 238 | 3690 |
| 2 Vaisâkha ... | 9745 | 29.235 | 52 | 0.157 | 19 Mar. (78) | 0 Sat. | 23 | 1 | 9 | 12 | 21 Feb. (52) | 2 Mon. | 141 | .423 | 9872 | 181 | 207 | 3691 |
| ........ | ... | ..... | ... | ..... | 19 Mar. (78) | 1 Sun. | 38 | 32 | 15 | 25 | 12 Mar. (71) | 1 Sun. | 141 | .423 | 9907 | 117 | 259 | 3692 |
| 11 Mâgha..... | 9888 | 29.663 | 195 | 0.585 | 19 Mar. (78) | 2 Mon. | 54 | 4 | 21 | 37 | 2 Mar. (61) | 6 Fri. | 262 | .786 | 122 | 1 | 230 | 3693 |
| ........ | ... | ..... | ... | ..... | 19 Mar. (79) | 4 Wed. | 9 | 35 | 3 | 50 | 19 Feb. (50) | 3 Tues. | 26 | .078 | 9997 | 848 | 200 | 3694 |
| ........ | ... | ..... | ... | ..... | 19 Mar. (78) | 5 Thur. | 25 | 6 | 10 | 2 | 9 Mar. (68) | 2 Mon. | 35 | .105 | 32 | 784 | 251 | 3695 |
| 7 Âsvina..... | 9723 | 29.170 | 31 | 0.092 | 19 Mar. (78) | 6 Fri. | 40 | 37 | 16 | 15 | 27 Feb. (58) | 0 Sat. | 265 | .795 | 246 | 668 | 223 | 3696 |
| ........ | ... | ..... | ... | ..... | 19 Mar. (78) | 0 Sat. | 56 | 9 | 22 | 27 | 17 Mar. (76) | 5 Thur. | 24 | .072 | 9942 | 567 | 271 | 3697 |
| ........ | ... | ..... | ... | ..... | 19 Mar. (79) | 2 Mon. | 11 | 40 | 4 | 40 | 5 Mar. (65) | 2 Mon. | 29 | .087 | 9817 | 414 | 241 | 3698 |
| 4 Âshâdha ... | 9866 | 29.598 | 173 | 0.520 | 19 Mar. (78) | 3 Tues. | 27 | 11 | 10 | 52 | 23 Feb. (54) | 0 Sat. | 308 | .924 | 32 | 298 | 212 | 3699 |
| ........ | ... | ..... | ... | ..... | 19 Mar. (78) | 4 Wed. | 42 | 42 | 17 | 5 | 13 Mar. (72) | 5 Thur. | ② — | — | 9728 | 198 | 261 | 3700 |
| 12 Phâlguna.... | 9701 | 29.104 | 9 | 0.026 | 19 Mar. (78) | 5 Thur. | 58 | 14 | 23 | 17 | 3 Mar. (62) | 3 Tues. | 152 | .456 | 9943 | 81 | 233 | 3701 |
| ........ | ... | ..... | ... | ..... | 19 Mar. (79) | 0 Sat. | 13 | 45 | 5 | 30 | 21 Feb. (52) | 1 Sun. | 270 | .810 | 157 | 965 | 205 | 3702 |
| ........ | ... | ..... | ... | ..... | 19 Mar. (78) | 1 Sun. | 29 | 16 | 11 | 42 | 11 Mar. (70) | 0 Sat. | 249 | .747 | 192 | 900 | 256 | 3703 |
| 9 Mârgasîrsha . | 9844 | 29.532 | 151 | 0.454 | 19 Mar. (78) | 2 Mon. | 44 | 47 | 17 | 55 | 28 Feb. (59) | 4 Wed. | 67 | .201 | 67 | 748 | 225 | 3704 |
| ........ | ... | ..... | ... | ..... | 20 Mar. (79) | 4 Wed. | 0 | 19 | 0 | 7 | 19 Mar. (78) | 3 Tues. | 115 | .345 | 102 | 684 | 277 | 3705 |
| ........ | ... | ..... | ... | ..... | 19 Mar. (79) | 5 Thur. | 15 | 50 | 6 | 20 | 7 Mar. (67) | 0 Sat. | 91 | .273 | 9978 | 531 | 246 | 3706 |
| 6 Bhâdrapada . | 9987 | 29.961 | 294 | 0.888 | 19 Mar. (78) | 6 Fri. | 31 | 21 | 12 | 32 | 24 Feb. (55) | 4 Wed. | 92 | .276 | 9854 | 378 | 215 | 3707 |
| ........ | ... | ..... | ... | ..... | 19 Mar. (78) | 0 Sat. | 46 | 52 | 18 | 45 | 15 Mar. (74) | 3 Tues. | 157 | .471 | 9888 | 314 | 266 | 3708 |
| ........ | ... | ..... | ... | ..... | 20 Mar. (79) | 2 Mon. | 2 | 24 | 0 | 57 | 4 Mar. (63) | 0 Sat. | 22 | .066 | 9764 | 161 | 236 | 3709 |
| 2 Vaisâkha.... | 9822 | 29.467 | 130 | 0.389 | 19 Mar. (79) | 3 Tues. | 17 | 55 | 7 | 10 | 22 Feb. (53) | 5 Thur. | 160 | .480 | 9978 | 45 | 208 | 3710 |
| ........ | ... | ..... | ... | ..... | 19 Mar. (78) | 4 Wed. | 33 | 26 | 13 | 22 | 12 Mar. (71) | 4 Wed. | 135 | .405 | 13 | 981 | 259 | 3711 |
| 11 Mâgha..... | 9965 | 29.895 | 272 | 0.817 | 19 Mar. (78) | 5 Thur. | 48 | 57 | 19 | 35 | 2 Mar. (61) | 2 Mon. | 261 | .783 | 227 | 864 | 231 | 3712 |
| ........ | ... | ..... | ... | ..... | 20 Mar. (79) | 0 Sat. | 4 | 29 | 1 | 47 | 19 Feb. (50) | 6 Fri. | 110 | .330 | 108 | 711 | 200 | 3713 |
| ........ | ... | ..... | ... | ..... | 19 Mar. (79) | 1 Sun. | 20 | 0 | 8 | 0 | 9 Mar. (69) | 5 Thur. | 166 | .498 | 138 | 648 | 251 | 3714 |
| 7 Âsvina...... | 9800 | 29.401 | 108 | 0.323 | 19 Mar. (78) | 2 Mon. | 35 | 31 | 14 | 12 | 26 Feb. (57) | 2 Mon. | 159 | .477 | 13 | 495 | 220 | 3715 |
| ........ | ... | ..... | ... | ..... | 19 Mar. (78) | 3 Tues. | 51 | 2 | 20 | 25 | 17 Mar. (76) | 1 Sun. | 247 | .741 | 48 | 431 | 272 | 3716 |
| ........ | ... | ..... | ... | ..... | 20 Mar. (79) | 5 Thur. | 6 | 34 | 2 | 37 | 6 Mar. (65) | 5 Thur. | 201 | .603 | 9924 | 278 | 241 | 3717 |
| 4 Âshâdha .... | 9943 | 29.830 | 251 | 0.752 | 19 Mar. (79) | 6 Fri. | 22 | 5 | 8 | 50 | 23 Feb. (54) | 2 Mon. | 40 | .120 | 9799 | 125 | 210 | 3718 |
| ........ | ... | ..... | ... | ..... | 19 Mar. (78) | 0 Sat. | 37 | 36 | 15 | 2 | 13 Mar. (72) | 1 Sun. | 28 | .084 | 9834 | 61 | 261 | 3719 |

② See Text, Art. 101 above, para 2.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR | | | | | | | | II. ADDED LUNAR MONTHS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| | | | | | | | | | Time of the preceding saṅkrânti expressed in | | Time of the succeeding saṅkrânti expressed in | |
| Kali. | Śaka | Chaitrâdi Vikrama | Meshâdi (Solar) year in Bengal | Kollam. | A. D. | (Southern.) | Bṛihaspati cycle (Northern) current at Mesha saṅkrânti. | Name of month. | Lunation parts (*l.*) | Tithis. | Lunation parts (*l.*) | Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 3720 | 541 | 676 | 25 | — | 618–19 | 9 Yuvan | | | | | | |
| 3721 | 542 | 677 | 26 | — | 619–20 | 10 Dhâtṛi | | 2 Vaiśâkha | 9469 | 28.407 | 35 | 0.105 |
| 3722 | 543 | 678 | 27 | — | *620–21 | 11 Îśvara | | | | | | |
| 3723 | 544 | 679 | 28 | — | 621–22 | 12 Bahudhânya | | 6 Bhâdrapada | 9467 | 28.401 | 92 | 0.276 |
| 3724 | 545 | 680 | 29 | — | 622–23 | 13 Pramâthin | | | | | | |
| 3725 | 546 | 681 | 30 | — | 623–24 | 14 Vikrama | | | | | | |
| 3726 | 547 | 682 | 31 | — | *624–25 | 15 Vṛisha | | 5 Śrâvaṇa | 9842 | 29.526 | 520 | 1.560 |
| 3727 | 548 | 683 | 32 | — | 625–26 | 16 Chitrabhânu | | | | | | |
| 3728 | 549 | 684 | 33 | — | 626–27 | 17 Subhânu | | | | | | |
| 3729 | 550 | 685 | 34 | — | 627–28 | 18 Târaṇa | | 3 Jyeshṭha | 9580 | 28.740 | 358 | 1.074 |
| 3730 | 551 | 686 | 35 | — | *628–29 | 19 Pârthiva | | | | | | |
| 3731 | 552 | 687 | 36 | — | 629–30 | 20 Vyaya | | 7 Âśvina<br>10 *Pausha (Ksh.)* | 9640<br>101 | 28.920<br>0.303 | 19<br>9968 | 0.057<br>29.904 |
| 3732 | 553 | 688 | 37 | — | 630–31 | 21 Sarvajit | | 1 Chaitra | 9870 | 29.610 | 70 | 0.210 |
| 3733 | 554 | 689 | 38 | — | 631–32 | 22 Sarvadhârin | | | | | | |
| 3734 | 555 | 690 | 39 | — | *632–33 | 23 Virodhin | | 5 Śrâvaṇa | 9406 | 28.218 | 7 | 0.021 |
| 3735 | 556 | 691 | 40 | — | 633–34 | 24 Vikṛita | | | | | | |
| 3736 | 557 | 692 | 41 | — | 634–35 | 25 Khara | | | | | | |
| 3737 | 558 | 693 | 42 | — | 635–36 | 26 Nandana | | 4 Âshâḍha | 9890 | 29.670 | 644 | 1.932 |
| 3738 | 559 | 694 | 43 | — | *636–37 | 27 Vijaya | | | | | | |
| 3739 | 560 | 695 | 44 | — | 637–38 | 28 Jaya | | | | | | |
| 3740 | 561 | 696 | 45 | — | 638–39 | 29 Manmatha | | 2 Vaiśâkha | 9551 | 28.653 | 31 | 0.093 |
| 3741 | 562 | 697 | 46 | — | 639–40 | 30 Durmukha | | | | | | |
| 3742 | 563 | 698 | 47 | — | *640–41 | 31 Hemalamba | | 6 Bhâdrapada | 9504 | 28.512 | 60 | 0.180 |
| 3743 | 564 | 699 | 48 | — | 641–42 | 32 Vilamba | | | | | | |
| 3744 | 565 | 700 | 49 | — | 642–43 | 33 Vikârin | | | | | | |
| 3745 | 566 | 701 | 50 | — | 643–44 | 34 Śârvari | | 4 Âshâḍha | 9408 | 28.224 | 129 | 0.387 |
| 3746 | 567 | 702 | 51 | — | *644–45 | 35 Plava | | | | | | |
| 3747 | 568 | 703 | 52 | — | 645–46 | 36 Śubhakṛit | | | | | | |
| 3748 | 569 | 704 | 53 | — | 646–47 | 37 Śobhana | | 3 Jyeshṭha | 9555 | 28.665 | 323 | 0.969 |
| 3749 | 570 | 705 | 54 | — | 647–48 | 38 Krodhin | | | | | | |
| 3750 | 571 | 706 | 55 | — | *648–49 | 39 Viśvâvasu | | 8 Kârttika | 9994 | 29.982 | 171 | 0.513 |
| 3751 | 572 | 707 | 56 | — | 649–50 | 40 Parâbhava | | | | | | |

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

| II. ADDED LUNAR MONTHS (continued.) | | | | | III. COMMENCEMENT OF THE | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean. | | | | | Solar year. | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | |
| Name of month. | Time of the preceding saṅkrânti expressed in: Lunation parts (t.) | Tithis. | Time of the succeeding saṅkrânti expressed in: Lunation parts (t.) | Tithis. | Day and Month A. D. | (Time of the Mesha saṅkrânti.) Week day. | By the Ârya Siddhânta. Gh. | Pa. | H. | M. | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. Moon's Age. Lunar parts elapsed. (t.) | Tithis elapsed. | a. | b. | c. | Kali. |
| 8a | 9a | 10a | 11a | 12a | 13 | 14 | 15 | | 17 | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 12 Phâlguna.... | 9779 | 29.336 | 86 | 0.258 | 19 Mar. (78) | 1 Sun. | 53 | 7 | 21 | 15 | 8 Mar. (62) | 6 Fri. | 140 | .420 | 48 | 945 | 233 | 3720 |
| ........ | .... | ...... | .... | ...... | 20 Mar. (79) | 3 Tues. | 8 | 39 | 3 | 27 | 21 Feb. (52) | 4 Wed. | 281 | .843 | 265 | 826 | 205 | 3721 |
| ........ | .... | ...... | .... | ...... | 19 Mar. (79) | 4 Wed. | 24 | 10 | 9 | 40 | 11 Mar. (71) | 3 Tues. | 297 | .891 | 297 | 764 | 256 | 3722 |
| 9 Mârgaśirsha. | 9921 | 29.764 | 229 | 0.686 | 19 Mar. (78) | 5 Thur. | 39 | 41 | 15 | 52 | 28 Feb. (59) | 0 Sat. | 222 | .666 | 173 | 611 | 226 | 3723 |
| ........ | .... | ...... | .... | ...... | 19 Mar. (78) | 6 Fri. | 55 | 12 | 22 | 5 | 19 Mar. (78) | 6 Fri. | 308 | .924 | 208 | 547 | 277 | 3724 |
| ........ | .... | ...... | .... | ...... | 20 Mar. (79) | 1 Sun. | 10 | 44 | 4 | 17 | 8 Mar. (67) | 3 Tues. | 310 | .930 | 83 | 394 | 246 | 3725 |
| 5 Śrâvana..... | 9757 | 29.270 | 64 | 0.192 | 19 Mar. (79) | 2 Mon. | 26 | 15 | 10 | 30 | 25 Feb. (56) | 0 Sat. | 240 | .720 | 9959 | 242 | 215 | 3726 |
| ........ | .... | ...... | .... | ...... | 19 Mar. (78) | 3 Tues. | 41 | 46 | 16 | 42 | 15 Mar. (74) | 6 Fri. | 260 | .780 | 9994 | 178 | 267 | 3727 |
| ........ | .... | ...... | .... | ...... | 19 Mar. (78) | 4 Wed. | 57 | 17 | 22 | 55 | 4 Mar. (63) | 3 Tues. | 31 | .093 | 9869 | 25 | 236 | 3728 |
| 2 Vaiśâkha ... | 9900 | 29.699 | 207 | 0.621 | 20 Mar. (79) | 6 Fri. | 12 | 49 | 5 | 7 | 22 Feb. (53) | 1 Sun. | 149 | .447 | 84 | 908 | 208 | 3729 |
| ........ | .... | ...... | .... | ...... | 19 Mar. (79) | 0 Sat. | 28 | 20 | 11 | 20 | 12 Mar. (72) | 0 Sat. | 142 | .426 | 118 | 844 | 259 | 3730 |
| 10 Pausha.... | 9735 | 29.205 | 42 | 0.127 | 19 Mar. (78) | 1 Sun. | 43 | 51 | 17 | 32 | 1 Mar. (60) | 4 Wed. | 4 | .012 | 9994 | 691 | 228 | 3731 |
| ........ | .... | ...... | .... | ...... | 19 Mar. (78) | 2 Mon. | 59 | 22 | 23 | 45 | 19 Feb. (50) | 2 Mon. | 287 | .861 | 208 | 575 | 200 | 3732 |
| ........ | .... | ...... | .... | ...... | 20 Mar. (79) | 4 Wed. | 14 | 54 | 5 | 57 | 9 Mar. (68) | 0 Sat. | 66 | .198 | 9904 | 475 | 249 | 3733 |
| 7 Âśvina...... | 9878 | 29.633 | 185 | 0.555 | 19 Mar. (79) | 5 Thur. | 30 | 25 | 12 | 10 | 26 Feb. (57) | 4 Wed. | 47 | .141 | 9780 | 322 | 218 | 3734 |
| ........ | .... | ...... | .... | ...... | 19 Mar. (78) | 6 Fri. | 45 | 56 | 18 | 22 | 16 Mar. (75) | 3 Tues. | 95 | .285 | 9816 | 258 | 269 | 3735 |
| ........ | .... | ...... | .... | ...... | 20 Mar. (79) | 1 Sun. | 1 | 27 | 0 | 35 | 6 Mar. (65) | 1 Sun. | 278 | .834 | 20 | 142 | 241 | 3736 |
| 3 Jyeshtha.... | 9713 | 29.139 | 20 | 0.061 | 20 Mar. (79) | 2 Mon. | 16 | 59 | 6 | 47 | 23 Feb. (54) | 5 Thur. | 37 | .111 | 9905 | 980 | 210 | 3737 |
| ........ | .... | ...... | .... | ...... | 19 Mar. (79) | 3 Tues. | 32 | 30 | 13 | 0 | 13 Mar. (73) | 4 Wed. | 16 | .048 | 9940 | 925 | 262 | 3738 |
| 12 Phâlguna. | 9856 | 29.569 | 163 | 0.490 | 19 Mar. (78) | 4 Wed. | 48 | 1 | 19 | 12 | 3 Mar. (62) | 2 Mon. | 163 | .489 | 154 | 808 | 234 | 3739 |
| ........ | .... | ...... | .... | ...... | 20 Mar. (79) | 6 Fri. | 3 | 32 | 1 | 25 | 20 Feb. (51) | 6 Fri. | 57 | .171 | 30 | 655 | 203 | 3740 |
| ........ | .... | ...... | .... | ...... | 20 Mar. (79) | 0 Sat. | 19 | 4 | 7 | 37 | 11 Mar. (70) | 5 Thur. | 128 | .384 | 64 | 591 | 254 | 3741 |
| 9 Mârgaśirsha. | 9999 | 29.996 | 306 | 0.918 | 19 Mar. (79) | 1 Sun. | 34 | 35 | 13 | 50 | 28 Feb. (59) | 2 Mon. | 134 | .402 | 9940 | 439 | 223 | 3742 |
| ........ | .... | ...... | .... | ...... | 19 Mar. (78) | 2 Mon. | 50 | 6 | 20 | 2 | 18 Mar. (77) | 1 Sun. | 215 | .645 | 9975 | 374 | 274 | 3743 |
| ........ | .... | ...... | .... | ...... | 20 Mar. (79) | 4 Wed. | 5 | 37 | 2 | 15 | 7 Mar. (66) | 5 Thur. | 127 | .381 | 9850 | 222 | 244 | 3744 |
| 5 Śrâvana .... | 9834 | 29.502 | 141 | 0.424 | 20 Mar. (79) | 5 Thur. | 21 | 9 | 8 | 27 | 25 Feb. (56) | 3 Tues. | 292 | .876 | 65 | 105 | 216 | 3745 |
| ........ | .... | ...... | .... | ...... | 19 Mar. (79) | 6 Fri. | 36 | 40 | 14 | 40 | 15 Mar. (75) | 2 Mon. | 275 | .825 | 99 | 41 | 267 | 3746 |
| ........ | .... | ...... | .... | ...... | 19 Mar. (78) | 0 Sat. | 52 | 11 | 20 | 52 | 4 Mar. (63) | 6 Fri. | 24 | .072 | 9975 | 888 | 236 | 3747 |
| 2 Vaiśâkha ... | 9977 | 29.930 | 284 | 0.853 | 20 Mar. (79) | 2 Mon. | 7 | 42 | 3 | 5 | 22 Feb. (53) | 4 Wed. | 192 | .576 | 189 | 772 | 208 | 3748 |
| ........ | .... | ...... | .... | ...... | 20 Mar. (79) | 3 Tues. | 23 | 14 | 9 | 17 | 13 Mar. (72) | 3 Tues. | 227 | .681 | 224 | 708 | 259 | 3749 |
| 10 Pausha..... | 9812 | 29.437 | 120 | 0.359 | 19 Mar. (79) | 4 Wed. | 38 | 45 | 15 | 30 | 1 Mar. (61) | 0 Sat. | 192 | .576 | 100 | 555 | 228 | 3750 |
| ........ | .... | ...... | .... | ...... | 19 Mar. (78) | 5 Thur. | 54 | 16 | 21 | 42 | 20 Mar. (79) | 6 Fri. | 285 | .855 | 134 | 491 | 280 | 3751 |

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | |
| Kali. | Śaka. | Chaitrâdi Vikrama. | Meshâdi (Saura) year in Bengal. | Kollam. | A. D. | (Southern.) | Brihaspati cycle (Northern) current at Mesha sankrânti | Name of month | Time of the preceding sankrânti expressed in Lunation parts. (t.) | Tithis. | Time of the succeeding sankrânti expressed in Lunation parts. (t.) | Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 3752 | 573 | 708 | 57 | — | 650-51 | 41 Plavanga | | | | | | |
| 3753 | 574 | 709 | 58 | — | 651-52 | 42 Kîlaka | | 5 Śrâvana | 9604 | 28.812 | 168 | 0.504 |
| 3754 | 575 | 710 | 59 | — | *652-53 | 43 Saumya | | | | | | |
| 3755 | 576 | 711 | 60 | — | 653-54 | 44 Sâdhârana[1]) | | | | | | |
| 3756 | 577 | 712 | 61 | — | 654-55 | 46 Paridhâvin | | 4 Âshâḍha | 9871 | 29.613 | 722 | 2.166 |
| 3757 | 578 | 713 | 62 | — | 655-56 | 47 Pramâdin | | | | | | |
| 3758 | 579 | 714 | 63 | — | *656-57 | 48 Ânanda | | | | | | |
| 3759 | 580 | 715 | 64 | — | 657-58 | 49 Râkshasa | | 2 Vaiśâkha | 9725 | 29.175 | 127 | 0.381 |
| 3760 | 581 | 716 | 65 | — | 658-59 | 50 Anala | | | | | | |
| 3761 | 582 | 717 | 66 | — | 659-60 | 51 Pingala | | 6 Bhâdrapada | 9638 | 28.914 | 104 | 0.312 |
| 3762 | 583 | 718 | 67 | — | *660-61 | 52 Kâlayukta | | | | | | |
| 3763 | 584 | 719 | 68 | — | 661-62 | 53 Siddhârthin | | | | | | |
| 3764 | 585 | 720 | 69 | — | 662-63 | 54 Raudra | | 4 Ashâḍha | 9415 | 28.245 | 238 | 0.714 |
| 3765 | 586 | 721 | 70 | — | 663-64 | 55 Durmati | | | | | | |
| 3766 | 587 | 722 | 71 | — | *664-65 | 56 Dundubhi | | | | | | |
| 3767 | 588 | 723 | 72 | — | 665-66 | 57 Rudhirodgârin | | 3 Jyeshtha | 9615 | 28.845 | 290 | 0.870 |
| 3768 | 589 | 724 | 73 | — | 666-67 | 58 Raktâksha | | | | | | |
| 3769 | 590 | 725 | 74 | — | 667-68 | 59 Krodhana | | 8 Kârttika | 9959 | 29.877 | 132 | 0.396 |
| 3770 | 591 | 726 | 75 | — | *668-69 | 60 Kshaya | | | | | | |
| 3771 | 592 | 727 | 76 | — | 669-70 | 1 Prabhava | | | | | | |
| 3772 | 593 | 728 | 77 | — | 670-71 | 2 Vibhava | | 5 Śrâvana | 9746 | 29.238 | 365 | 1.095 |
| 3773 | 594 | 729 | 78 | — | 671-72 | 3 Śukla | | | | | | |
| 3774 | 595 | 730 | 79 | — | *672-73 | 4 Pramoda | | | | | | |
| 3775 | 596 | 731 | 80 | — | 673-74 | 5 Prajâpati | | 4 Âshâḍha | 9833 | 29.499 | 706 | 2.118 |
| 3776 | 597 | 732 | 81 | — | 674-75 | 6 Angiras | | | | | | |
| 3777 | 598 | 733 | 82 | — | 675-76 | 7 Śrîmukha | | | | | | |
| 3778 | 599 | 734 | 83 | — | *676-77 | 8 Bhâva | | 2 Vaiśâkha | 9915 | 29.745 | 303 | 0.909 |
| 3779 | 600 | 735 | 84 | — | 677-78 | 9 Yuvan | | | | | | |
| 3780 | 601 | 736 | 85 | — | 678-79 | 10 Dhâtri | | 6 Bhâdrapada | 9831 | 29.493 | 246 | 0.738 |
| 3781 | 602 | 737 | 86 | — | 679-80 | 11 Îśvara | | | | | | |
| 3782 | 603 | 738 | 87 | — | *680-81 | 12 Bahudhânya | | | | | | |
| 3783 | 604 | 739 | 88 | — | 681-82 | 13 Pramâthin | | 4 Âshâḍha | 9373 | 28.119 | 248 | 0.744 |
| 3784 | 605 | 740 | 89 | — | 682-83 | 14 Vikrama | | | | | | |

1) Virodhakrit No. 45 was suppressed.

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

| II. ADDED LUNAR MONTHS (continued.) | | | | | III. COMMENCEMENT OF THE | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean. | | | | | Solar year | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | Kali. |
| Name of month | Time of the preceding saṅkrânti expressed in | | Time of the succeeding saṅkrânti expressed in | | Day and Month A. D. | (Time of the Mesha saṅkrânti.) | | | | | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. | | | | | |
| | | | | | | Week day. | By the Ârya Siddhânta. | | | | | | Moon's Age. | | | | | |
| | Lunation parts (t.) | Tithis. | Lunation parts (t.) | Tithis. | | | Gh. | Pa. | H. | M. | | | Lunat. parts elapsed. (t.) | Tithis elapsed. | a. | b. | c. | |
| 8a | 9a | 10a | 11a | 12a | 13 | 14 | 15 | | 17 | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| ........ | .... | ........ | .... | ....... | 20 Mar. (79) | 0 Sat. | 9 | 47 | 3 | 55 | 9 Mar. (68) | 3 Tues. | 267 | .801 | 10 | 338 | 249 | 3752 |
| 7 Âśvina .... | 9955 | 29.865 | 262 | 0.787 | 20 Mar. (79) | 1 Sun. | 25 | 19 | 10 | 7 | 26 Feb. (57) | 0 Sat. | 155 | .465 | 9886 | 186 | 218 | 3753 |
| ........ | .... | ........ | .... | ....... | 19 Mar. (79) | 2 Mon. | 40 | 50 | 16 | 20 | 16 Mar. (76) | 6 Fri. | 157 | .471 | 9920 | 122 | 269 | 3754 |
| ........ | .... | ........ | .... | ....... | 19 Mar. (78) | 3 Tues. | 56 | 21 | 22 | 32 | 6 Mar. (65) | 4 Wed. | 279 | .837 | 135 | 5 | 241 | 3755 |
| 3 Jyeshṭha .. | 9790 | 29.371 | 98 | 0.293 | 20 Mar. (79) | 5 Thur. | 11 | 52 | 4 | 45 | 23 Feb. (54) | 1 Sun. | 40 | .120 | 10 | 852 | 211 | 3756 |
| ........ | .... | ........ | .... | ....... | 20 Mar. (79) | 6 Fri. | 27 | 24 | 10 | 57 | 14 Mar. (73) | 0 Sat. | 49 | .147 | 45 | 788 | 262 | 3757 |
| 12 Phâlguna.. | 9933 | 29.800 | 241 | 0.722 | 19 Mar. (79) | 0 Sat. | 42 | 55 | 17 | 10 | 3 Mar. (63) | 5 Thur. | 275 | .825 | 259 | 672 | 234 | 3758 |
| ........ | .... | ........ | .... | ....... | 19 Mar. (78) | 1 Sun. | 58 | 26 | 23 | 22 | 20 Feb. (51) | 2 Mon. | 261 | .783 | 135 | 519 | 203 | 3759 |
| ........ | .... | ........ | .... | ....... | 20 Mar. (79) | 3 Tues. | 13 | 57 | 5 | 35 | 10 Mar. (69) | 0 Sat. | 40 | .120 | 9831 | 419 | 252 | 3760 |
| 8 Kârttika .. | 9769 | 29.306 | 76 | 0.228 | 20 Mar. (79) | 4 Wed. | 29 | 29 | 11 | 47 | 28 Feb. (59) | 5 Thur. | 319 | .957 | 46 | 302 | 223 | 3761 |
| ........ | .... | ........ | .... | ....... | 19 Mar. (79) | 5 Thur. | 45 | 0 | 18 | 0 | 17 Mar. (77) | 3 Tues. | 16 | .048 | 9742 | 202 | 272 | 3762 |
| ........ | .... | ........ | .... | ....... | 20 Mar. (79) | 0 Sat. | 0 | 31 | 0 | 12 | 7 Mar. (66) | 1 Sun. | 167 | .501 | 9956 | 85 | 244 | 3763 |
| 5 Śrâvaṇa.. | 9911 | 29.734 | 219 | 0.656 | 20 Mar. (79) | 1 Sun. | 16 | 2 | 6 | 25 | 25 Feb. (56) | 6 Fri. | 284 | .852 | 170 | 969 | 216 | 3764 |
| ........ | .... | ........ | .... | ....... | 20 Mar. (79) | 2 Mon. | 31 | 34 | 12 | 37 | 16 Mar. (75) | 5 Thur. | 266 | .798 | 205 | 905 | 267 | 3765 |
| ........ | .... | ........ | .... | ....... | 19 Mar. (79) | 3 Tues. | 47 | 5 | 18 | 50 | 4 Mar. (64) | 2 Mon. | 81 | .243 | 81 | 752 | 236 | 3766 |
| 1 Chaitra ... | 9747 | 29.240 | 54 | 0.162 | 20 Mar. (79) | 5 Thur. | 2 | 36 | 1 | 2 | 21 Feb. (52) | 6 Fri. | 16 | .048 | 9956 | 599 | 205 | 3767 |
| ........ | .... | ........ | .... | ....... | 20 Mar. (79) | 6 Fri. | 18 | 7 | 7 | 15 | 12 Mar. (71) | 5 Thur. | 101 | .303 | 9991 | 535 | 257 | 3768 |
| 10 Pausha. | 9890 | 29.669 | 197 | 0.591 | 20 Mar. (79) | 0 Sat. | 33 | 39 | 13 | 27 | 1 Mar. (60) | 2 Mon. | 102 | .306 | 9867 | 382 | 226 | 3769 |
| ........ | .... | ........ | .... | ....... | 19 Mar. (79) | 1 Sun. | 49 | 10 | 19 | 40 | 19 Mar. (79) | 1 Sun. | 170 | .510 | 9901 | 318 | 277 | 3770 |
| ........ | .... | ........ | .... | ....... | 20 Mar. (79) | 3 Tues. | 4 | 41 | 1 | 52 | 8 Mar. (67) | 5 Thur. | 38 | .114 | 9777 | 166 | 246 | 3771 |
| 6 Bhâdrapada | 9725 | 29.175 | 32 | 0.097 | 20 Mar. (79) | 4 Wed. | 20 | 12 | 8 | 5 | 26 Feb. (57) | 3 Tues. | 175 | .525 | 9991 | 49 | 218 | 3772 |
| ........ | .... | ........ | .... | ....... | 20 Mar. (79) | 5 Thur. | 35 | 44 | 14 | 17 | 17 Mar. (76) | 2 Mon. | 152 | .456 | 26 | 985 | 270 | 3773 |
| ........ | .... | ........ | .... | ....... | 19 Mar. (79) | 6 Fri. | 51 | 15 | 20 | 30 | 6 Mar. (66) | 0 Sat. | 277 | .831 | 240 | 869 | 242 | 3774 |
| 3 Jyeshṭha ... | 9868 | 29.603 | 175 | 0.525 | 20 Mar. (79) | 1 Sun. | 6 | 46 | 2 | 42 | 23 Feb. (54) | 4 Wed. | 121 | .363 | 116 | 716 | 211 | 3775 |
| ........ | .... | ........ | .... | ....... | 20 Mar. (79) | 2 Mon. | 22 | 17 | 8 | 55 | 14 Mar. (73) | 3 Tues. | 177 | .531 | 151 | 652 | 262 | 3776 |
| 11 Mâgha. | 9703 | 29.109 | 10 | 0.031 | 20 Mar. (79) | 3 Tues. | 37 | 49 | 15 | 7 | 3 Mar. (62) | 0 Sat. | 168 | .504 | 27 | 499 | 231 | 3777 |
| ........ | .... | ........ | .... | ....... | 19 Mar. (79) | 4 Wed. | 53 | 20 | 21 | 20 | 20 Feb. (51) | 4 Wed. | 160 | .480 | 9902 | 346 | 200 | 3778 |
| ........ | .... | ........ | .... | ....... | 20 Mar. (79) | 6 Fri. | 8 | 51 | 3 | 32 | 10 Mar. (69) | 3 Tues. | 214 | .642 | 9937 | 282 | 252 | 3779 |
| 8 Kârttika ... | 9846 | 29.538 | 153 | 0.460 | 20 Mar. (79) | 0 Sat. | 24 | 22 | 9 | 45 | 27 Feb. (58) | 0 Sat. | 56 | .168 | 9813 | 130 | 221 | 3780 |
| ........ | .... | ........ | .... | ....... | 20 Mar. (79) | 1 Sun. | 39 | 54 | 15 | 57 | 18 Mar. (77) | 6 Fri. | 43 | .129 | 9847 | 65 | 272 | 3781 |
| ........ | .... | ........ | .... | ....... | 19 Mar. (79) | 2 Mon. | 55 | 25 | 22 | 10 | 7 Mar. (67) | 4 Wed. | 157 | .471 | 62 | 949 | 244 | 3782 |
| 5 Śrâvaṇa.. | 9989 | 29.966 | 296 | 0.888 | 20 Mar. (79) | 4 Wed. | 10 | 56 | 4 | 22 | 25 Feb. (56) | 2 Mon. | 295 | .885 | 276 | 832 | 216 | 3783 |
| ........ | .... | ........ | .... | ....... | 20 Mar. (79) | 5 Thur. | 26 | 27 | 10 | 35 | 16 Mar. (75) | 1 Sun. | 311 | .933 | 310 | 769 | 267 | 3784 |

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR | | | | | | | | II. ADDED LUNAR MONTHS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara | | True | | | | |
| | | | | | | | | | Time of the preceding sankrânti expressed in | | Time of the succeeding sankrânti expressed in | |
| Kali | Saka | Chaitrâdi Vikrama | Meshâdi (Solar) year in Bengal | Kollam | A. D. | (Southern) | Brihaspati cycle (Northern) current at Mesha sankrânti | Name of month | Lunation parts (*l.*) | Tithis | Lunation parts (*l.*) | Tithis |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 3785 | 606 | 741 | 90 | — | 683- 84 | ...... | 15 Vrisha | | | | | |
| 3786 | 607 | 742 | 91 | — | *684- 85 | ...... | 16 Chitrabhânu | 3 Jyeshtha | 9770 | 29.310 | 358 | 1.074 |
| 3787 | 608 | 743 | 92 | — | 685- 86 | ...... | 17 Subhânu | | | | | |
| 3788 | 609 | 744 | 93 | — | 686- 87 | ...... | 18 Târaṇa | 8 Kârttika | 9994 | 29.982 | 116 | 0.348 |
| 3789 | 610 | 745 | 94 | — | 687- 88 | ...... | 19 Pârthiva | | | | | |
| 3790 | 611 | 746 | 95 | — | *688- 89 | ...... | 20 Vyaya | | | | | |
| 3791 | 612 | 747 | 96 | — | 689- 90 | ...... | 21 Sarvajit | 5 Srâvaṇa | 9787 | 29.361 | 510 | 1.530 |
| 3792 | 613 | 748 | 97 | — | 690- 91 | ...... | 22 Sarvadhârin | | | | | |
| 3793 | 614 | 749 | 98 | — | 691- 92 | ...... | 23 Virodhin | | | | | |
| 3794 | 615 | 750 | 99 | — | *692- 93 | ...... | 24 Vikṛita | 4 Âshâḍha | 9859 | 29.577 | 666 | 1.998 |
| 3795 | 616 | 751 | 100 | — | 693- 94 | ...... | 25 Khara | | | | | |
| 3796 | 617 | 752 | 101 | — | 694- 95 | ...... | 26 Nandana | | | | | |
| 3797 | 618 | 753 | 102 | — | 695- 96 | ...... | 27 Vijaya | 1 Chaitra | 9748 | 29.244 | 48 | 0.144 |
| 3798 | 619 | 754 | 103 | — | *696- 97 | ...... | 28 Jaya | | | | | |
| 3799 | 620 | 755 | 104 | — | 697- 98 | ...... | 29 Manmatha | 5 Srâvaṇa | 9316 | 27.948 | 3 | 0.009 |
| 3800 | 621 | 756 | 105 | — | 698- 99 | ...... | 30 Durmukha | | | | | |
| 3801 | 622 | 757 | 106 | — | 699-700 | ...... | 31 Hemalamba | | | | | |
| 3802 | 623 | 758 | 107 | — | *700- 1 | ...... | 32 Vilamba | 4 Âshâḍha | 9372 | 28.116 | 209 | 0.627 |
| 3803 | 624 | 759 | 108 | — | 701- 2 | ...... | 33 Vikârin | | | | | |
| 3804 | 625 | 760 | 109 | — | 702- 3 | ...... | 34 Sârvari | | | | | |
| 3805 | 626 | 761 | 110 | — | 703- 4 | ...... | 35 Plava | 3 Jyeshtha | 9969 | 29.907 | 515 | 1.545 |
| 3806 | 627 | 762 | 111 | — | *704- 5 | ...... | 36 Śubhakrit | | | | | |
| 3807 | 628 | 763 | 112 | — | 705- 6 | ...... | 37 Śobhana | 7 Âśvina | 9901 | 29.703 | 131 | 0.393 |
| 3808 | 629 | 764 | 113 | — | 706- 7 | ...... | 38 Krodhin | | | | | |
| 3809 | 630 | 765 | 114 | — | 707- 8 | ...... | 39 Viśvâvasu | | | | | |
| 3810 | 631 | 766 | 115 | — | *708- 9 | ...... | 40 Parâbhava | 5 Srâvaṇa | 9755 | 29.265 | 554 | 1.662 |
| 3811 | 632 | 767 | 116 | — | 709- 10 | ...... | 41 Plavaṅga | | | | | |
| 3812 | 633 | 768 | 117 | — | 710- 11 | ...... | 42 Kîlaka | | | | | |
| 3813 | 634 | 769 | 118 | — | 711- 12 | ...... | 43 Saumya | 4 Âshâḍha | 9987 | 29.961 | 685 | 2.055 |
| 3814 | 635 | 770 | 119 | — | *712- 13 | ...... | 44 Sâdhâraṇa | | | | | |
| 3815 | 636 | 771 | 120 | — | 713- 14 | ...... | 45 Virodhakrit | | | | | |
| 3816 | 637 | 772 | 121 | — | 714- 15 | ...... | 46 Paridhâvin | 1 Chaitra | 9723 | 29.169 | 80 | 0.240 |
| 3817 | 638 | 773 | 122 | — | 715- 16 | ...... | 47 Pramâdin | | | | | |

# TABLE I.

(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.

| II. ADDED LUNAR MONTHS (continued.) | | | | | III. COMMENCEMENT OF THE | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean. | | | | | Solar year | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | | Kali. |
| Name of month | Time of the preceding saṅkrânti expressed in | | Time of the succeeding saṅkrânti expressed in | | Day and Month A. D. | (Time of the Mesha saṅkrânti.) | | | | | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. | | | | | | |
| | Lunation parts (l.) | Tithis | Lunation parts (l.) | Tithis. | | Week day. | By the Ârya Siddhânta. | | | | | | Moon's Age. | | a. | b. | c. | | |
| | | | | | | | Gh. | Pa. | H. | M. | | | Lunat. parts elapsed (l.) | Tithis elapsed | | | | | |
| 8a | 9a | 10a | 11a | 12a | 13 | 14 | 15 | | 17 | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 | |
| ...... | .... | ...... | .... | | 20 Mar. (79) | 6 Fri | 41 | 59 | 16 | 47 | 5 Mar. (64) | 5 Thur. | 233 | .699 | 186 | 616 | 236 | 3785 | |
| 1 Chaitra | 9824 | 29.472 | 131 | 0.394 | 19 Mar. (79) | 0 Sat. | 57 | 30 | 23 | 0 | 22 Feb. (53) | 2 Mon. | 236 | .708 | 62 | 463 | 209 | 3786 | |
| ...... | .... | ...... | | ...... | 20 Mar. (79) | 2 Mon | 13 | 1 | 5 | 12 | 12 Mar. (71) | 1 Sun. | 321 | .963 | 97 | 390 | 257 | 3787 | |
| 10 Pausha | 9967 | 29.900 | 274 | 0.823 | 20 Mar. (79) | 3 Tues. | 28 | 32 | 11 | 25 | 1 Mar. (60) | 5 Thur. | 252 | .756 | 9972 | 246 | 226 | 3788 | |
| ...... | .... | ...... | .... | | 20 Mar. (79) | 4 Wed | 44 | 4 | 17 | 37 | 20 Mar. (79) | 4 Wed | 276 | .828 | 7 | 182 | 277 | 3789 | |
| ...... | .... | | | | 19 Mar. (79) | 5 Thur | 59 | 35 | 23 | 50 | 8 Mar. (68) | 1 Sun | 48 | .144 | 9883 | 29 | 247 | 3790 | |
| 6 Bhâdrapada | 9802 | 29.407 | 110 | 0.329 | 20 Mar. (79) | 0 Sat | 15 | 6 | 6 | 2 | 26 Feb. (57) | 6 Fri | 165 | .495 | 97 | 913 | 219 | 3791 | |
| ...... | | ...... | .... | ...... | 20 Mar. (79) | 1 Sun | 30 | 37 | 12 | 15 | 17 Mar. (76) | 5 Thur. | 158 | .474 | 132 | 840 | 270 | 3792 | |
| ...... | .... | ...... | .... | ...... | 20 Mar. (79) | 2 Mon | 46 | 9 | 18 | 27 | 6 Mar. (65) | 2 Mon | 15 | .045 | 7 | 696 | 239 | 3793 | |
| 3 Jyeshtha | 9945 | 29.835 | 252 | 0.757 | 20 Mar. (80) | 4 Wed | 1 | 40 | 0 | 40 | 24 Feb. (55) | 0 Sat | 296 | .888 | 222 | 580 | 211 | 3794 | |
| ...... | | ...... | | | 20 Mar. (79) | 5 Thur. | 17 | 11 | 6 | 52 | 13 Mar. (72) | 5 Thur | 77 | .231 | 9918 | 479 | 259 | 3795 | |
| 11 Mâgha | 9780 | 29.341 | 88 | 0.263 | 20 Mar. (79) | 6 Fri | 32 | 42 | 13 | 5 | 2 Mar. (61) | 2 Mon | 57 | .171 | 9793 | 326 | 229 | 3796 | |
| ...... | | ...... | .... | | 20 Mar. (79) | 0 Sat. | 48 | 14 | 19 | 17 | 20 Feb. (51) | 0 Sat | 287 | .861 | 8 | 210 | 201 | 3797 | |
| ...... | | ...... | | ...... | 20 Mar. (80) | 2 Mon | 3 | 45 | 1 | 30 | 10 Mar. (70) | 6 Fri | 293 | .879 | 42 | 146 | 252 | 3798 | |
| 8 Kârttika | 9923 | 29.769 | 231 | 0.691 | 20 Mar. (79) | 3 Tues | 19 | 16 | 7 | 42 | 27 Feb. (58) | 3 Tues | 53 | .159 | 9918 | 993 | 221 | 3799 | |
| ...... | | ...... | .... | ...... | 20 Mar. (79) | 4 Wed | 34 | 47 | 13 | 55 | 18 Mar. (77) | 2 Mon | 32 | .096 | 9953 | 929 | 272 | 3800 | |
| ...... | .... | | | ...... | 20 Mar. (79) | 5 Thur | 50 | 19 | 20 | 7 | 8 Mar. (67) | 0 Sat. | 178 | .534 | 167 | 812 | 244 | 3801 | |
| 4 Âshâḍha | 9759 | 29.276 | 66 | 0.198 | 20 Mar. (80) | 0 Sat. | 5 | 50 | 2 | 20 | 25 Feb. (56) | 4 Wed | 67 | .201 | 43 | 660 | 213 | 3802 | |
| ...... | | ...... | | | 20 Mar. (79) | 1 Sun | 21 | 21 | 8 | 32 | 15 Mar. (74) | 3 Tues | 139 | .417 | 78 | 596 | 265 | 3803 | |
| ...... | .... | ...... | .... | ...... | 20 Mar. (79) | 2 Mon. | 36 | 52 | 14 | 45 | 4 Mar. (63) | 0 Sat | 141 | .423 | 9953 | 443 | 234 | 3804 | |
| 1 Chaitra | 9901 | 29.704 | 209 | 0.626 | 20 Mar. (79) | 3 Tues. | 52 | 24 | 20 | 57 | 21 Feb. (52) | 4 Wed. | 108 | .324 | 9829 | 290 | 203 | 3805 | |
| ...... | ... | ...... | | | 20 Mar. (80) | 5 Thur. | 7 | 55 | 3 | 10 | 11 Mar. (71) | 3 Tues | 142 | .426 | 9864 | 226 | 254 | 3806 | |
| 9 Mârgaśîrsha | 9737 | 29.210 | 44 | 0.132 | 20 Mar. (79) | 6 Fri | 23 | 26 | 9 | 22 | 1 Mar. (60) | 1 Sun. | 308 | .924 | 78 | 110 | 226 | 3807 | |
| ...... | .... | ...... | .... | ...... | 20 Mar. (79) | 0 Sat | 38 | 57 | 15 | 35 | 20 Mar. (79) | 0 Sat | 294 | .882 | 114 | 46 | 278 | 3808 | |
| ...... | .... | ...... | .... | ...... | 20 Mar. (79) | 1 Sun | 54 | 29 | 21 | 47 | 9 Mar. (68) | 4 Wed. | 40 | .120 | 9988 | 893 | 247 | 3809 | |
| 6 Bhâdrapada | 9879 | 29.638 | 187 | 0.561 | 20 Mar. (80) | 3 Tues | 10 | 0 | 4 | 0 | 27 Feb. (58) | 2 Mon | 206 | .618 | 203 | 776 | 219 | 3810 | |
| ...... | ... | ...... | .... | ...... | 20 Mar. (79) | 4 Wed | 25 | 31 | 10 | 12 | 17 Mar. (76) | 1 Sun | 241 | .723 | 237 | 712 | 270 | 3811 | |
| ...... | .... | ...... | .... | ...... | 20 Mar. (79) | 5 Thur. | 41 | 2 | 16 | 25 | 6 Mar. (65) | 5 Thur | 201 | .603 | 113 | 560 | 239 | 3812 | |
| 2 Vaiśâkha | 9715 | 29.145 | 22 | 0.067 | 20 Mar. (79) | 6 Fri. | 56 | 34 | 22 | 37 | 23 Feb. (54) | 2 Mon | 209 | .627 | 9989 | 407 | 208 | 3813 | |
| ...... | | ...... | ... | | 20 Mar. (80) | 1 Sun | 12 | 5 | 4 | 50 | 13 Mar. (73) | 1 Sun | 280 | .840 | 23 | 343 | 260 | 3814 | |
| 11 Mâgha | 9858 | 29.573 | 165 | 0.495 | 20 Mar. (79) | 2 Mon. | 27 | 36 | 11 | 2 | 2 Mar. (61) | 5 Thur | 169 | .507 | 9899 | 190 | 229 | 3815 | |
| ...... | .... | ...... | | | 20 Mar. (79) | 3 Tues | 43 | 7 | 17 | 15 | 20 Feb. (51) | 3 Tues | 318 | .954 | 113 | 73 | 201 | 3816 | |
| ...... | | ...... | | | 20 Mar. (79) | 4 Wed | 58 | 39 | 23 | 27 | 11 Mar. (70) | 2 Mon | 296 | .888 | 148 | 9 | 252 | 3817 | |

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara | | True. | | | | |
| | | | | | | | | | Time of the preceding sankrânti expressed in | | Time of the succeeding sankrânti expressed in | |
| Kali. | Śaka. | Chaitrâdi Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | (Southern.) | Brihaspati cycle (Northern) current at Mesha sankrânti. | Name of month. | Lunation parts (*l.*) | Tithis. | Lunation parts (*l.*) | Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 3818 | 639 | 774 | 123 | — | *716-17 | ...... | 48 Ânanda | 5 Śrâvaṇa | 9301 | 27.903 | 83 | 0.249 |
| 3819 | 640 | 775 | 124 | — | 717-18 | ...... | 49 Râkshasa | | | | | |
| 3820 | 641 | 776 | 125 | — | 718-19 | ...... | 50 Anala | | | | | |
| 3821 | 642 | 777 | 126 | — | 719-20 | ...... | 51 Piṅgala | 4 Âshâḍha | 9466 | 28.398 | 201 | 0.603 |
| 3822 | 643 | 778 | 127 | — | *720-21 | ...... | 52 Kâlayukta | | | | | |
| 3823 | 644 | 779 | 128 | — | 721-22 | ...... | 53 Siddhârthin | | | | | |
| 3824 | 645 | 780 | 129 | — | 722-23 | ...... | 54 Raudra | 2 Vaiśâkha | 9611 | 28.833 | 118 | 0.354 |
| 3825 | 646 | 781 | 130 | — | 723-24 | ...... | 55 Durmati | | | | | |
| 3826 | 647 | 782 | 131 | — | *724-25 | ...... | 56 Dundubhi | 6 Bhâdrapada | 9600 | 28.800 | 90 | 0.270 |
| 3827 | 648 | 783 | 132 | — | 725-26 | ...... | 57 Rudhirodgârin | | | | | |
| 3828 | 649 | 784 | 133 | — | 726-27 | ...... | 58 Raktâksha | | | | | |
| 3829 | 650 | 785 | 134 | — | 727-28 | ...... | 59 Krodhana | 5 Śrâvaṇa | 9728 | 29.184 | 522 | 1.566 |
| 3830 | 651 | 786 | 135 | — | *728-29 | ...... | 60 Kshaya | | | | | |
| 3831 | 652 | 787 | 136 | — | 729-30 | ...... | 1 Prabhava | | | | | |
| 3832 | 653 | 788 | 137 | — | 730-31 | ...... | 2 Vibhava | 3 Jyeshṭha | 9610 | 28.830 | 178 | 0.534 |
| 3833 | 654 | 789 | 138 | — | 731-32 | ...... | 3 Śukla | | | | | |
| 3834 | 655 | 790 | 139 | — | *732-33 | ...... | 4 Pramoda | | | | | |
| 3835 | 656 | 791 | 140 | — | 733-34 | ...... | 5 Prajâpati | 1 Chaitra | 9690 | 29.070 | 44 | 0.132 |
| 3836 | 657 | 792 | 141 | — | 734-35 | ...... | 6 Aṅgiras | | | | | |
| 3837 | 658 | 793 | 142 | — | 735-36 | ...... | 7 Śrîmukha | 5 Śrâvaṇa | 9261 | 27.783 | 68 | 0.204 |
| 3838 | 659 | 794 | 143 | — | *736-37 | ...... | 8 Bhâva | | | | | |
| 3839 | 660 | 795 | 144 | — | 737-38 | ...... | 9 Yuvan | | | | | |
| 3840 | 661 | 796 | 145 | — | 738-39 | ...... | 10 Dhâtri [1] | 4 Âshâḍha | 9643 | 28.929 | 288 | 0.864 |
| 3841 | 662 | 797 | 146 | — | 739-40 | ...... | 12 Bahudhânya | | | | | |
| 3842 | 663 | 798 | 147 | — | *740-41 | ...... | 13 Pramâthin | | | | | |
| 3843 | 664 | 799 | 148 | — | 741-42 | ...... | 14 Vikrama | 2 Vaiśâkha | 9590 | 28.770 | 172 | 0.516 |
| 3844 | 665 | 800 | 149 | — | 742-43 | ...... | 15 Vṛisha | | | | | |
| 3845 | 666 | 801 | 150 | — | 743-44 | ...... | 16 Chitrabhânu | 6 Bhâdrapada | 9612 | 28.836 | 194 | 0,582 |
| 3846 | 667 | 802 | 151 | — | *744-45 | ...... | 17 Subhânu | | | | | |
| 3847 | 668 | 803 | 152 | — | 745-46 | ...... | 18 Târaṇa | | | | | |
| 3848 | 669 | 804 | 153 | — | 746-47 | ...... | 19 Pârthiva | 5 Śrâvaṇa | 9780 | 29.340 | 492 | 1.476 |
| 3849 | 670 | 805 | 154 | — | 747-48 | ...... | 20 Vyaya | | | | | |
| 3850 | 671 | 806 | 155 | — | *748-49 | ...... | 21 Sarvajit | | | | | |

[1] Îśvara, No. 11, was suppressed.

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

| II. ADDED LUNAR MONTHS (continued.) | | | | | III. COMMENCEMENT OF THE | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean. | | | | | Solar year | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | | Kali. |
| Name of month | Time of the preceding saṅkrânti expressed in Lunation parts (t.) | Time of the preceding saṅkrânti expressed in Tithis. | Time of the succeeding saṅkrânti expressed in Lunation parts (t.) | Time of the succeeding saṅkrânti expressed in Tithis. | Day and Month A. D. | (Time of the Mesha saṅkrânti.) Week day. | By the Ârya Siddhânta. Gh. | Pa. | H. | M. | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. Moon's Age. Lunat. parts elapsed. (t.) | Tithis elapsed. | a. | b. | c. | |
| 8a | 9a | 10a | 11a | 12a | 13 | 14 | 15 | | 17 | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 7 Âśvina | 9693 | 29.079 | 0 | 0.001 | 20 Mar. (80) | 6 Fri. | 14 | 10 | 5 | 40 | 28 Feb. (59) | 6 Fri. | 55 | .165 | 24 | 857 | 221 | 3818 |
| | | | | | 20 Mar. (79) | 0 Sat. | 29 | 41 | 11 | 52 | 18 Mar. (77) | 5 Thur. | 63 | 189 | 58 | 792 | 273 | 3819 |
| | | | | | 20 Mar. (79) | 1 Sun. | 45 | 12 | 18 | 5 | 8 Mar. (67) | 3 Tues. | 287 | 861 | 273 | 676 | 245 | 3820 |
| 4 Âshâḍha | 9836 | 29.507 | 143 | 0.430 | 21 Mar. (80) | 3 Tues. | 0 | 44 | 0 | 17 | 25 Feb. (56) | 0 Sat. | 269 | 807 | 148 | 523 | 214 | 3821 |
| | | | | | 20 Mar. (80) | 4 Wed. | 16 | 15 | 6 | 30 | 14 Mar. (74) | 5 Thur. | 51 | 153 | 9845 | 423 | 262 | 3822 |
| | | | | | 20 Mar. (79) | 5 Thur. | 31 | 46 | 12 | 42 | 4 Mar. (63) | 3 Tues. | 330 | 990 | 59 | 306 | 234 | 3823 |
| 1 Chaitra | 9979 | 29.936 | 279 | 0.838 | 20 Mar. (79) | 6 Fri. | 47 | 17 | 18 | 55 | 21 Feb. (52) | 0 Sat. | 193 | 579 | 9935 | 154 | 203 | 3824 |
| | | | | | 21 Mar. (80) | 1 Sun. | 2 | 49 | 1 | 7 | 12 Mar. (71) | 6 Fri. | 184 | 552 | 9969 | 90 | 255 | 3825 |
| 9 Mârgaśirsha | 9814 | 29.442 | 121 | 0.364 | 20 Mar. (80) | 2 Mon. | 18 | 20 | 7 | 20 | 1 Mar. (61) | 4 Wed. | 300 | 900 | 184 | 973 | 227 | 3826 |
| | | | | | 20 Mar. (79) | 3 Tues. | 33 | 51 | 13 | 32 | 20 Mar. (79) | 3 Tues. | 283 | 849 | 218 | 909 | 278 | 3827 |
| | | | | | 20 Mar. (79) | 4 Wed. | 49 | 22 | 19 | 45 | 9 Mar. (68) | 0 Sat. | 94 | .282 | 94 | 756 | 247 | 3828 |
| 6 Bhâdrapada | 9957 | 29.870 | 264 | 0.792 | 21 Mar. (80) | 6 Fri. | 4 | 54 | 1 | 57 | 26 Feb. (57) | 4 Wed. | 26 | .078 | 9970 | 603 | 216 | 3829 |
| | | | | | 20 Mar. (80) | 0 Sat. | 20 | 25 | 8 | 10 | 16 Mar. (76) | 3 Tues. | 109 | 327 | 4 | 540 | 267 | 3830 |
| | | | | | 20 Mar. (79) | 1 Sun. | 35 | 56 | 14 | 22 | 5 Mar. (64) | 0 Sat. | 112 | .336 | 9880 | 387 | 237 | 3831 |
| 2 Vaiśâkha | 9792 | 29.376 | 100 | 0.299 | 20 Mar. (79) | 2 Mon. | 51 | 27 | 20 | 35 | 22 Feb. (53) | 4 Wed. | 37 | .111 | 9756 | 234 | 206 | 3832 |
| | | | | | 21 Mar. (80) | 4 Wed. | 6 | 59 | 2 | 47 | 13 Mar. (72) | 3 Tues. | 53 | .159 | 9790 | 170 | 257 | 3833 |
| 11 Mâgha | 9935 | 29.805 | 242 | 0.727 | 20 Mar. (80) | 5 Thur. | 22 | 30 | 9 | 0 | 2 Mar. (62) | 1 Sun. | 192 | 576 | 5 | 54 | 229 | 3834 |
| | | | | | 20 Mar. (79) | 6 Fri. | 38 | 1 | 15 | 12 | 20 Feb. (51) | 6 Fri. | 308 | 924 | 219 | 937 | 201 | 3835 |
| | | | | | 20 Mar. (79) | 0 Sat. | 53 | 32 | 21 | 25 | 11 Mar. (70) | 5 Thur. | 294 | 882 | 254 | 873 | 252 | 3836 |
| 7 Âśvina | 9770 | 29.311 | 78 | 0.233 | 21 Mar. (80) | 2 Mon. | 9 | 4 | 3 | 37 | 28 Feb. (59) | 2 Mon. | 133 | 399 | 129 | 720 | 222 | 3837 |
| | | | | | 20 Mar. (80) | 3 Tues. | 24 | 35 | 9 | 50 | 18 Mar. (78) | 1 Sun. | 188 | 564 | 164 | 656 | 273 | 3838 |
| | | | | | 20 Mar. (79) | 4 Wed. | 40 | 6 | 16 | 2 | 7 Mar. (66) | 5 Thur. | 177 | 531 | 40 | 503 | 242 | 3839 |
| 4 Âshâḍha | 9913 | 29.739 | 220 | 0.661 | 20 Mar. (79) | 5 Thur. | 55 | 37 | 22 | 15 | 24 Feb. (55) | 2 Mon. | 170 | 510 | 9915 | 351 | 211 | 3840 |
| | | | | | 21 Mar. (80) | 0 Sat. | 11 | 9 | 4 | 27 | 15 Mar. (74) | 1 Sun. | 226 | 678 | 9950 | 286 | 262 | 3841 |
| 12 Phâlguna | 9749 | 29.246 | 56 | 0.168 | 20 Mar. (80) | 1 Sun. | 26 | 40 | 10 | 40 | 3 Mar. (63) | 5 Thur. | 70 | .210 | 9826 | 134 | 232 | 3842 |
| | | | | | 20 Mar. (79) | 2 Mon. | 42 | 11 | 16 | 52 | 21 Feb. (52) | 3 Tues. | 198 | 594 | 40 | 17 | 204 | 3843 |
| | | | | | 20 Mar. (79) | 3 Tues. | 57 | 42 | 23 | 5 | 12 Mar. (71) | 2 Mon. | 174 | 522 | 75 | 953 | 255 | 3844 |
| 9 Mârgaśirsha | 9891 | 29.674 | 199 | 0.596 | 21 Mar. (80) | 5 Thur. | 13 | 14 | 5 | 17 | 2 Mar. (61) | 0 Sat. | 309 | .927 | 289 | 837 | 227 | 3845 |
| | | | | | 20 Mar. (80) | 6 Fri. | 28 | 45 | 11 | 30 | 20 Mar. (80) | 6 Fri. | 327 | 981 | 324 | 773 | 278 | 3846 |
| | | | | | 20 Mar. (79) | 0 Sat. | 44 | 16 | 17 | 42 | 9 Mar. (68) | 3 Tues. | 244 | 732 | 200 | 620 | 247 | 3847 |
| 5 Śrâvaṇa | 9727 | 29.180 | 34 | 0.102 | 20 Mar. (79) | 1 Sun. | 59 | 47 | 23 | 55 | 26 Feb. (57) | 0 Sat. | 245 | 735 | 75 | 467 | 216 | 3848 |
| | | | | | 21 Mar. (80) | 3 Tues. | 15 | 19 | 6 | 7 | 17 Mar. (76) | 6 Fri. | 331 | 993 | 110 | 403 | 268 | 3849 |
| | | | | | 20 Mar. (80) | 4 Wed. | 30 | 50 | 12 | 20 | 5 Mar. (65) | 3 Tues. | 265 | 795 | 9985 | 250 | 237 | 3850 |

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| Kali. | Śaka. | Chaitrâdi. Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | (Southern.) | Brihaspati cycle (Northern) current at Mesha saṅkrânti | Name of month | Time of the preceding saṅkrânti expressed in: Lunation parts (t.) | Time of the preceding saṅkrânti expressed in: Tithis. | Time of the succeeding saṅkrânti expressed in: Lunation parts (t.) | Time of the succeeding saṅkrânti expressed in: Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 13 |
| 3851 | 672 | 807 | 156 | — | 749-50 | ....... | 22 Sarvadhârin ........ | 3 Jyeshṭha .. | 9697 | 29.091 | 353 | 1.059 |
| 3852 | 673 | 808 | 157 | — | 750-51 | ....... | 23 Virodhin.......... | ........ | ...... | ........ | ...... | ...... |
| 3853 | 674 | 809 | 158 | — | 751-52 | ....... | 24 Vikṛita ........... | ........ | ...... | ........ | ...... | ...... |
| 3854 | 675 | 810 | 159 | — | *752-53 | ....... | 25 Khara............. | 1 Chaitra | 9723 | 29.169 | 22 | 0.066 |
| 3855 | 676 | 811 | 160 | — | 753-54 | ....... | 26 Nandana........... | ........ | ...... | ........ | ...... | ...... |
| 3856 | 677 | 812 | 161 | — | 754-55 | ....... | 27 Vijaya............. | 5 Śrâvaṇa. | 9283 | 27.849 | 29 | 0.087 |
| 3857 | 678 | 813 | 162 | — | 755-56 | ....... | 28 Jaya ............. | ........ | ...... | ........ | ...... | ...... |
| 3858 | 679 | 814 | 163 | — | *756-57 | ....... | 29 Manmatha........ | ........ | ...... | ........ | ...... | ...... |
| 3859 | 680 | 815 | 164 | — | 757-58 | ....... | 30 Durmukha......... | 4 Âshâḍha . | 9835 | 29.505 | 463 | 1.389 |
| 3860 | 681 | 816 | 165 | — | 758-59 | ....... | 31 Hemalamba......... | ........ | ...... | ........ | ...... | ...... |
| 3861 | 682 | 817 | 166 | — | 759-60 | ....... | 32 Vilamba .......... | ........ | ...... | ........ | ...... | ...... |
| 3862 | 683 | 818 | 167 | — | *760-61 | ....... | 33 Vikârin........... | 2 Vaiśâkha. | 9554 | 28.662 | 142 | 0.426 |
| 3863 | 684 | 819 | 168 | — | 761-62 | ....... | 34 Śârvari .......... | ........ | ...... | ........ | ...... | ...... |
| 3864 | 685 | 820 | 169 | — | 762-63 | ....... | 35 Plava............ | 6 Bhâdrapada.. | 9570 | 28.710 | 199 | 0.597 |
| 3865 | 686 | 821 | 170 | — | 763-64 | ....... | 36 Śubhakṛit.......... | ........ | ...... | ........ | ...... | ...... |
| 3866 | 687 | 822 | 171 | — | *764-65 | ....... | 37 Śobhana........... | ........ | ...... | ........ | ...... | ...... |
| 3867 | 688 | 823 | 172 | — | 765-66 | ....... | 38 Krodhin........... | 5 Śrâvaṇa..... | 9929 | 29.787 | 543 | 1.629 |
| 3868 | 689 | 824 | 173 | — | 766-67 | ....... | 39 Viśvâvasu.......... | ........ | ...... | ........ | ...... | ...... |
| 3869 | 690 | 825 | 174 | — | 767-68 | ....... | 40 Parâbhava.......... | ........ | ...... | ........ | ...... | ...... |
| 3870 | 691 | 826 | 175 | — | *768-69 | ....... | 41 Plavaṅga.......... | 3 Jyeshṭha .. | 9691 | 29.073 | 440 | 1.320 |
| 3871 | 692 | 827 | 176 | — | 769-70 | ....... | 42 Kîlaka............ | ........ | ...... | ........ | ...... | ...... |
| 3872 | 693 | 828 | 177 | — | 770-71 | ....... | 43 Saumya........... | 7 Âśvina.<br>10 *Pausha (Ksh.)* | 9740<br>115 | 29.220<br>0.345 | 88<br>9964 | 0.264<br>29.892 |
| 3873 | 694 | 829 | 178 | — | 771-72 | ....... | 44 Sâdhâraṇa......... | 1 Chaitra . | 9860 | 29.580 | 86 | 0.258 |
| 3874 | 695 | 830 | 179 | — | *772-73 | ....... | 45 Virodhakṛit ........ | ........ | ...... | ........ | ...... | ...... |
| 3875 | 696 | 831 | 180 | — | 773-74 | ....... | 46 Paridhâvin......... | 5 Śrâvaṇa.. | 9404 | 28.212 | 48 | 0.144 |
| 3876 | 697 | 832 | 181 | — | 774-75 | ....... | 47 Pramâthin.......... | ........ | ...... | ........ | ...... | ...... |
| 3877 | 698 | 833 | 182 | — | 775-76 | ....... | 48 Ânanda .......... | ........ | ...... | ........ | ...... | ...... |
| 3878 | 699 | 834 | 183 | — | *776-77 | ....... | 49 Râkshasa.......... | 4 Âshâḍha . | 9955 | 29.865 | 655 | 1.965 |
| 3879 | 700 | 835 | 184 | — | 777-78 | ....... | 50 Anala............ | ........ | ...... | ........ | ...... | ...... |
| 3880 | 701 | 836 | 185 | — | 778-79 | ....... | 51 Piṅgala........... | ........ | ...... | ........ | ...... | ...... |
| 3881 | 702 | 837 | 186 | — | 779-80 | ....... | 52 Kâlayukta ......... | 2 Vaiśâkha. | 9584 | 28.752 | 111 | 0.333 |
| 3882 | 703 | 838 | 187 | — | *780-81 | ....... | 53 Siddhârthin........ | ........ | ...... | ........ | ...... | ...... |

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

| II. ADDED LUNAR MONTHS (continued.) | | | | | III. COMMENCEMENT OF THE | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean. | | | | | Solar year | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | Kali |
| Name of month. | Time of the preceding saṅkrânti expressed in Lunation parts. (*t*.) | Time of the preceding saṅkrânti expressed in Tithis. | Time of the succeeding saṅkrânti expressed in Lunation parts. (*t*.) | Time of the succeeding saṅkrânti expressed in Tithis. | Day and Month A. D. | (Time of the Mesha saṅkrânti.) Week day. | By the Ârya Siddhânta Gh. Pa. | By the Ârya Siddhânta H. M. | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. Moon's Age. Lunar parts elapsed. (*t*.) | Moon's Age. Tithis elapsed. | *a*. | *b*. | *c*. | |
| 8a | 9a | 10a | 11a | 12a | 13 | 14 | 15 | 17 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 2 Vaiśâkha | 9869 | 29.608 | 177 | 0.530 | 20 Mar. (79) | 5 Thur. | 46 21 | 18 32 | 22 Feb. (53) | 0 Sat. | 84 | .252 | 9861 | 97 | 206 | 3851 |
| | | | | | 21 Mar. (80) | 0 Sat. | 1 52 | 0 45 | 13 Mar. (72) | 6 Fri. | 66 | .198 | 9896 | 34 | 257 | 3852 |
| 10 Pausha | 9705 | 29.115 | 12 | 0.037 | 21 Mar. (80) | 1 Sun. | 17 24 | 6 57 | 3 Mar. (62) | 4 Wed. | 181 | .543 | 111 | 917 | 229 | 3853 |
| | | | | | 20 Mar. (80) | 2 Mon. | 32 55 | 13 10 | 20 Feb. (51) | 1 Sun. | ⊛—11 | —.033 | 9986 | 784 | 198 | 3854 |
| | | | | | 20 Mar. (79) | 3 Tues. | 48 26 | 19 22 | 10 Mar. (69) | 0 Sat. | 28 | .084 | 21 | 700 | 250 | 3855 |
| 7 Âśvina | 9848 | 29.543 | 155 | 0.465 | 21 Mar. (80) | 5 Thur. | 3 57 | 1 35 | 28 Feb. (59) | 5 Thur. | 305 | .915 | 235 | 584 | 222 | 3856 |
| | | | | | 21 Mar. (80) | 6 Fri. | 19 29 | 7 47 | 18 Mar. (77) | 3 Tues. | 86 | .258 | 9931 | 483 | 270 | 3857 |
| | | | | | 20 Mar. (80) | 0 Sat. | 35 0 | 14 0 | 6 Mar. (66) | 0 Sat. | 70 | .210 | 9807 | 331 | 239 | 3858 |
| 4 Âshâḍha | 9990 | 29.971 | 298 | 0.893 | 20 Mar. (79) | 1 Sun. | 50 31 | 20 12 | 24 Feb. (55) | 5 Thur. | 299 | .897 | 21 | 214 | 211 | 3859 |
| | | | | | 21 Mar. (80) | 3 Tues. | 6 2 | 2 25 | 15 Mar. (74) | 4 Wed. | 309 | .927 | 56 | 150 | 263 | 3860 |
| 12 Phâlguna | 9826 | 29.477 | 133 | 0.399 | 21 Mar. (80) | 4 Wed. | 21 34 | 8 37 | 4 Mar. (63) | 1 Sun. | 68 | .204 | 9931 | 997 | 232 | 3861 |
| | | | | | 20 Mar. (80) | 5 Thur. | 37 5 | 14 50 | 22 Feb. (53) | 6 Fri. | 194 | .582 | 146 | 861 | 204 | 3862 |
| | | | | | 20 Mar. (79) | 6 Fri. | 52 36 | 21 2 | 12 Mar. (71) | 5 Thur. | 192 | .576 | 180 | 817 | 255 | 3863 |
| 9 Mârgaśîrsha | 9969 | 29.906 | 276 | 0.828 | 21 Mar. (80) | 1 Sun. | 8 7 | 3 15 | 1 Mar. (60) | 2 Mon. | 77 | .231 | 56 | 664 | 224 | 3864 |
| | | | | | 21 Mar. (80) | 2 Mon. | 23 39 | 9 27 | 20 Mar. (79) | 1 Sun. | 148 | .444 | 91 | 600 | 276 | 3865 |
| | | | | | 20 Mar. (80) | 3 Tues. | 39 10 | 15 40 | 8 Mar. (68) | 5 Thur. | 152 | .456 | 9966 | 447 | 245 | 3866 |
| 5 Śrâvaṇa | 9804 | 29.412 | 111 | 0.334 | 20 Mar. (79) | 4 Wed. | 54 41 | 21 52 | 25 Feb. (56) | 2 Mon. | 119 | .357 | 9842 | 294 | 214 | 3867 |
| | | | | | 21 Mar. (80) | 6 Fri. | 10 12 | 4 5 | 16 Mar. (75) | 1 Sun. | 156 | .468 | 9877 | 231 | 265 | 3868 |
| | | | | | 21 Mar. (80) | 0 Sat. | 25 44 | 10 17 | 6 Mar. (65) | 6 Fri. | 323 | .969 | 91 | 114 | 237 | 3869 |
| 2 Vaiśâkha | 9947 | 29.840 | 254 | 0.762 | 20 Mar. (80) | 1 Sun. | 41 15 | 16 30 | 23 Feb. (54) | 3 Tues. | 75 | .225 | 9967 | 961 | 206 | 3870 |
| | | | | | 20 Mar. (79) | 2 Mon. | 56 46 | 22 42 | 13 Mar. (72) | 2 Mon. | 56 | .168 | 1 | 897 | 258 | 3871 |
| 10 Pausha | 9782 | 29.346 | 89 | 0.268 | 21 Mar. (80) | 4 Wed. | 12 17 | 4 55 | 3 Mar. (62) | 0 Sat. | 219 | .657 | 216 | 781 | 230 | 3872 |
| | | | | | 21 Mar. (80) | 5 Thur. | 27 49 | 11 7 | 20 Feb. (51) | 4 Wed. | 134 | .402 | 92 | 628 | 199 | 3873 |
| | | | | | 20 Mar. (80) | 6 Fri. | 43 20 | 17 20 | 10 Mar. (70) | 3 Tues. | 211 | .633 | 126 | 564 | 250 | 3874 |
| 7 Âśvina | 9925 | 29.775 | 232 | 0.697 | 20 Mar. (79) | 0 Sat. | 58 51 | 23 32 | 27 Feb. (58) | 0 Sat. | 217 | .651 | 2 | 411 | 219 | 3875 |
| | | | | | 21 Mar. (80) | 2 Mon. | 14 22 | 5 45 | 18 Mar. (77) | 6 Fri. | 292 | .876 | 37 | 347 | 271 | 3876 |
| | | | | | 21 Mar. (80) | 3 Tues. | 29 54 | 11 57 | 7 Mar. (66) | 3 Tues. | 183 | .549 | 9912 | 194 | 240 | 3877 |
| 3 Jyeshṭha | 9760 | 29.281 | 68 | 0.203 | 20 Mar. (80) | 4 Wed. | 45 25 | 18 10 | 24 Feb. (55) | 0 Sat. | ⊛—44 | —.132 | 9788 | 41 | 209 | 3878 |
| | | | | | 21 Mar. (80) | 6 Fri. | 0 56 | 0 22 | 15 Mar. (74) | 0 Sat. | 318 | .954 | 161 | 14 | 283 | 3879 |
| 12 Phâlguna | 9903 | 29.709 | 210 | 0.631 | 21 Mar. (80) | 0 Sat. | 16 27 | 6 35 | 4 Mar. (63) | 4 Wed. | 70 | .210 | 37 | 861 | 232 | 3880 |
| | | | | | 21 Mar. (80) | 1 Sun. | 31 59 | 12 47 | 22 Feb. (53) | 2 Mon. | 254 | .762 | 251 | 744 | 204 | 3881 |
| | | | | | 20 Mar. (80) | 2 Mon. | 47 30 | 19 0 | 12 Mar. (72) | 1 Sun. | 299 | .897 | 286 | 680 | 255 | 3882 |

⊛ See Text. Art. 101 above, para. 2

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| Kali. | Śaka. | Chaitrâdi. Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | (Southern.) | Brihaspati cycle (Northern) current at Mesha saṅkrânti. | Name of month. | Time of the preceding saṅkrânti expressed in | | Time of the succeeding saṅkrânti expressed in | |
| | | | | | | | | | Lunation parts. (*t.*) | Tithis. | Lunation parts. (*t.*) | Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 3883 | 704 | 839 | 188 | — | 781- 82 | ...... | 54 Raudra ........... | 6 Bhâdrapada.. | 9563 | 28.689 | 158 | 0.474 |
| 3884 | 705 | 840 | 189 | — | 782- 83 | ...... | 55 Durmati ........... | ........... | ...... | ...... | ...... | ...... |
| 3885 | 706 | 841 | 190 | — | 783- 84 | ...... | 56 Dundubhi........... | ........... | ...... | ...... | ...... | ...... |
| 3886 | 707 | 842 | 191 | — | *784- 85 | ...... | 57 Rudhirodgârin ...... | 4 Âshâḍha ... | 9457 | 28.371 | 127 | 0.381 |
| 3887 | 708 | 843 | 192 | — | 785- 86 | ...... | 58 Raktâksha........... | ........... | ...... | ...... | ...... | ...... |
| 3888 | 709 | 844 | 193 | — | 786- 87 | ...... | 59 Krodhana........... | ........... | ...... | ...... | ...... | ...... |
| 3889 | 710 | 845 | 194 | — | 787- 88 | ...... | 60 Kshaya ........... | 3 Jyeshṭha .. | 9647 | 28.941 | 434 | 1.302 |
| 3890 | 711 | 846 | 195 | — | *788- 89 | ...... | 1 Prabhava........... | ........... | ...... | ...... | ...... | ...... |
| 3891 | 712 | 847 | 196 | — | 789- 90 | ...... | 2 Vibhava ........... | 7 Âśvina.. | 9703 | 29.109 | 98 | 0.294 |
| 3892 | 713 | 848 | 197 | — | 790- 91 | ...... | 3 Śukla........... | ........... | ...... | ...... | ...... | ...... |
| 3893 | 714 | 849 | 198 | — | 791- 92 | ...... | 4 Pramoda ........... | ........... | ...... | ...... | ...... | ...... |
| 3894 | 715 | 850 | 199 | — | *792- 93 | ...... | 5 Prajâpati........... | 5 Śrâvaṇa.. | 9591 | 28.773 | 165 | 0.495 |
| 3895 | 716 | 851 | 200 | — | 793- 94 | ...... | 6 Angiras........... | ........... | ...... | ...... | ...... | ...... |
| 3896 | 717 | 852 | 201 | — | 794- 95 | ...... | 7 Śrîmukha........... | ........... | ...... | ...... | ...... | ...... |
| 3897 | 718 | 853 | 202 | — | 795- 96 | ...... | 8 Bhâva........... | 4 Âshâḍha .. | 9976 | 29.928 | 792 | 2.376 |
| 3898 | 719 | 854 | 203 | — | *796- 97 | ...... | 9 Yuvan ........... | ........... | ...... | ...... | ...... | ...... |
| 3899 | 720 | 855 | 204 | — | 797- 98 | ...... | 10 Dhâtri........... | ........... | ...... | ...... | ...... | ...... |
| 3900 | 721 | 856 | 205 | — | 798- 99 | ...... | 11 Îśvara........... | 2 Vaiśâkha.... | 9715 | 29.145 | 152 | 0.456 |
| 3901 | 722 | 857 | 206 | — | 799-800 | ...... | 12 Bahudhânya........... | ........... | ...... | ...... | ...... | ...... |
| 3902 | 723 | 858 | 207 | — | *800- 1 | ...... | 13 Pramâthin ........... | 6 Bhâdrapada.. | 9648 | 28.944 | 155 | 0.465 |
| 3903 | 724 | 859 | 208 | — | 801- 2 | ...... | 14 Vikrama........... | ........... | ...... | ...... | ...... | ...... |
| 3904 | 725 | 860 | 209 | — | 802- 3 | ...... | 15 Vrisha........... | ........... | ...... | ...... | ...... | ...... |
| 3905 | 726 | 861 | 210 | — | 803- 4 | ...... | 16 Chitrabhânu........... | 4 Âshâḍha . | 9510 | 28.530 | 282 | 0.846 |
| 3906 | 727 | 862 | 211 | — | *804- 5 | ...... | 17 Subhânu........... | ........... | ...... | ...... | ...... | ...... |
| 3907 | 728 | 863 | 212 | — | 805- 6 | ...... | 18 Târaṇa........... | ........... | ...... | ...... | ...... | ...... |
| 3908 | 729 | 864 | 213 | — | 806- 7 | ...... | 19 Pârthiva........... | 3 Jyeshṭha ... | 9660 | 28.980 | 392 | 1.176 |
| 3909 | 730 | 865 | 214 | — | 807- 8 | ...... | 20 Vyaya........... | ........... | ...... | ...... | ...... | ...... |
| 3910 | 731 | 866 | 215 | — | *808- 9 | ...... | 21 Sarvajit........... | 7 Âśvina. ... | 9680 | 29.040 | 58 | 0.174 |
| 3911 | 732 | 867 | 216 | — | 809- 10 | ...... | 22 Sarvadhârin........... | ........... | ...... | ...... | ...... | ...... |
| 3912 | 733 | 868 | 217 | — | 810- 11 | ...... | 23 Virodhin........... | ........... | ...... | ...... | ...... | ...... |
| 3913 | 734 | 869 | 218 | — | 811- 12 | ...... | 24 Vikṛita........... | 5 Śrâvaṇa.... | 9772 | 29.316 | 355 | 1.065 |
| 3914 | 735 | 870 | 219 | — | *812- 13 | ...... | 25 Khara........... | ........... | ...... | ...... | ...... | ...... |
| 3915 | 736 | 871 | 220 | — | 813- 14 | ...... | 26 Nandana........... | ........... | ...... | ...... | ...... | ...... |

# TABLE I.

(Col. 23) *a* = *Distance of moon from sun.* (Col. 24) *b* = *moon's mean anomaly.* (Col. 25) *c* = *sun's mean anomaly.*

| II. ADDED LUNAR MONTHS (continued.) | | | | | III. COMMENCEMENT OF THE | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean. | | | | | Solar year | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | Kali. |
| Name of month. | Time of the preceding sankrânti expressed in | | Time of the succeeding sankrânti expressed in | | Day and Month A. D. | (Time of the Mesha sankrânti.) | | | | | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. | | | | | |
| | | | | | | Week day | By the Ârya Siddhânta | | | | | | Moon's Age. | | | | | |
| | Lunation parts. (*t*.) | Tithis | Lunation parts. (*t*.) | Tithis | | | Gh. | Pa. | H. | M. | | | Lunat. parts elapsed. (*t*.) | Tithis elapsed. | *a*. | *b*. | *c*. | |
| 8a | 9a | 10a | 11a | 12a | 13 | 14 | 15 | | 17 | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 8 Kârttika.... | 9788 | 29.215 | 46 | 0.137 | 21 Mar. (80) | 4 Wed. | 3 | 1 | 1 | 12 | 1 Mar. (60) | 5 Thur | 278 | .834 | 162 | 528 | 225 | 3883 |
| ............ | .... | ....... | .... | ....... | 21 Mar. (80) | 5 Thur | 18 | 32 | 7 | 25 | 19 Mar. (78) | 3 Tues. | 60 | .180 | 9858 | 427 | 273 | 3884 |
| ............ | .... | ....... | .... | ....... | 21 Mar. (80) | 6 Fri. | 34 | 4 | 13 | 37 | 8 Mar. (67) | 0 Sat | 11 | .033 | 9733 | 274 | 242 | 3885 |
| 5 Śrâvaṇa..... | 9881 | 29.644 | 189 | 0.566 | 20 Mar. (80) | 0 Sat. | 49 | 35 | 19 | 50 | 26 Feb. (57) | 5 Thur. | 207 | .621 | 9948 | 158 | 214 | 3886 |
| ............ | .... | ....... | .... | ....... | 21 Mar. (80) | 2 Mon. | 5 | 6 | 2 | 2 | 16 Mar. (75) | 4 Wed | 200 | .600 | 9982 | 94 | 266 | 3887 |
| ............ | .... | ....... | .... | ....... | 21 Mar. (80) | 3 Tues. | 20 | 37 | 8 | 15 | 6 Mar. (65) | 2 Mon. | 317 | .951 | 197 | 978 | 237 | 3888 |
| 1 Chaitra..... | 9717 | 29.150 | 24 | 0.072 | 21 Mar. (80) | 4 Wed. | 36 | 9 | 14 | 27 | 23 Feb. (54) | 6 Fri | 89 | .267 | 72 | 825 | 207 | 3889 |
| ............ | .... | ....... | .... | ....... | 20 Mar. (80) | 5 Thur. | 51 | 40 | 20 | 40 | 13 Mar. (73) | 5 Thur | 107 | .321 | 107 | 761 | 258 | 3890 |
| 10 Pausha..... | 9859 | 29.578 | 167 | 0.500 | 21 Mar. (80) | 0 Sat. | 7 | 11 | 2 | 52 | 2 Mar. (61) | 2 Mon | 35 | .105 | 9983 | 608 | 227 | 3891 |
| ............ | .... | ....... | .... | ....... | 21 Mar. (80) | 1 Sun. | 22 | 42 | 9 | 5 | 21 Mar. (80) | 1 Sun | 119 | .357 | 17 | 544 | 278 | 3892 |
| ............ | .... | ....... | .... | ....... | 21 Mar. (80) | 2 Mon. | 38 | 14 | 15 | 17 | 10 Mar. (69) | 5 Thur. | 122 | .366 | 9893 | 391 | 247 | 3893 |
| 6 Bhâdrapada.. | 9695 | 29.084 | 2 | 0.007 | 20 Mar. (80) | 3 Tues. | 53 | 45 | 21 | 30 | 27 Feb. (58) | 2 Mon | 50 | .150 | 9769 | 238 | 217 | 3894 |
| ............ | .... | ....... | .... | ....... | 21 Mar. (80) | 5 Thur | 9 | 16 | 3 | 42 | 17 Mar. (76) | 1 Sun. | 68 | .204 | 9804 | 174 | 268 | 3895 |
| ............ | .... | ....... | .... | ....... | 21 Mar. (80) | 6 Fri. | 24 | 47 | 9 | 55 | 7 Mar. (66) | 6 Fri | 208 | .624 | 18 | 58 | 240 | 3896 |
| 3 Jyeshtha. .. | 9838 | 29.513 | 145 | 0.435 | 21 Mar. (80) | 0 Sat | 40 | 19 | 16 | 7 | 25 Feb. (56) | 4 Wed | 323 | .969 | 232 | 941 | 212 | 3897 |
| ............ | .... | ....... | .... | ....... | 20 Mar. (80) | 1 Sun | 55 | 50 | 22 | 20 | 15 Mar. (75) | 3 Tues. | 309 | .927 | 267 | 877 | 263 | 3898 |
| 12 Phâlguna.... | 9980 | 29.941 | 288 | 0.863 | 21 Mar. (80) | 3 Tues. | 11 | 21 | 4 | 32 | 4 Mar. (63) | 0 Sat. | 145 | .435 | 143 | 724 | 252 | 3899 |
| ............ | .... | ....... | .... | ....... | 21 Mar. (80) | 4 Wed. | 26 | 52 | 10 | 45 | 21 Feb. (52) | 4 Wed. | 99 | .297 | 18 | 572 | 202 | 3900 |
| ............ | .... | ....... | .... | ....... | 21 Mar. (80) | 5 Thur | 42 | 24 | 16 | 57 | 12 Mar. (71) | 3 Tues | 186 | .558 | 53 | 508 | 253 | 3901 |
| 8 Kârttika.... | 9816 | 29.447 | 123 | 0.369 | 20 Mar. (80) | 6 Fri | 57 | 55 | 23 | 10 | 29 Feb. (60) | 0 Sat | 181 | .543 | 9929 | 355 | 222 | 3902 |
| .. ?......... | .... | ....... | .... | ....... | 21 Mar. (80) | 1 Sun | 13 | 26 | 5 | 22 | 19 Mar. (78) | 6 Fri. | 239 | .717 | 9963 | 291 | 273 | 3903 |
| ............ | .... | ....... | .... | ....... | 21 Mar. (80) | 2 Mon | 28 | 57 | 11 | 35 | 8 Mar. (67) | 3 Tues | 88 | .264 | 9839 | 138 | 243 | 3904 |
| 5 Śrâvaṇa..... | 9959 | 29.876 | 266 | 0.798 | 21 Mar. (80) | 3 Tues | 44 | 29 | 17 | 47 | 26 Feb. (57) | 1 Sun | 214 | .642 | 53 | 21 | 214 | 3905 |
| ............ | .... | ....... | .... | ....... | 21 Mar. (81) | 5 Thur | 0 | 0 | 0 | 0 | 16 Mar. (76) | 0 Sat | 191 | .573 | 88 | 958 | 266 | 3906 |
| ............ | .... | ....... | .... | ....... | 21 Mar. (80) | 6 Fri | 15 | 31 | 6 | 12 | 6 Mar. (65) | 5 Thur | 324 | .972 | 302 | 841 | 238 | 3907 |
| 1 Chaitra..... | 9794 | 29.382 | 101 | 0.304 | 21 Mar. (80) | 0 Sat | 31 | 2 | 12 | 25 | 23 Feb. (54) | 2 Mon | 191 | .573 | 178 | 688 | 207 | 3908 |
| ............ | .... | ....... | .... | ....... | 21 Mar. (80) | 1 Sun. | 46 | 34 | 18 | 37 | 14 Mar. (73) | 1 Sun. | 255 | .765 | 213 | 624 | 258 | 3909 |
| 10 Pausha..... | 9937 | 29.810 | 244 | 0.732 | 21 Mar. (81) | 3 Tues | 2 | 5 | 0 | 50 | 3 Mar. (62) | 5 Thur. | 252 | .756 | 88 | 472 | 227 | 3910 |
| ............ | .... | ....... | .... | ....... | 21 Mar. (80) | 4 Wed | 17 | 36 | 7 | 2 | 20 Mar. (79) | 3 Tues | 26 | .078 | 9784 | 371 | 276 | 3911 |
| ............ | .... | ....... | .... | ....... | 21 Mar. (80) | 5 Thur | 33 | 7 | 13 | 15 | 10 Mar. (69) | 1 Sun. | 279 | .837 | 9999 | 255 | 248 | 3912 |
| 6 Bhâdrapada.. | 9772 | 29.316 | 79 | 0.238 | 21 Mar. (80) | 6 Fri | 48 | 39 | 19 | 27 | 27 Feb. (58) | 5 Thur | 100 | .300 | 9875 | 102 | 217 | 3913 |
| ............ | .... | ....... | .... | ....... | 21 Mar. (81) | 1 Sun. | 4 | 10 | 1 | 40 | 17 Mar. (77) | 4 Wed. | 82 | .246 | 9909 | 38 | 268 | 3914 |
| ............ | .... | ....... | .... | ....... | 21 Mar. (80) | 2 Mon | 19 | 41 | 7 | 52 | 7 Mar. (66) | 2 Mon. | 197 | .591 | 124 | 921 | 240 | 3915 |

# TABLE I.

*Lunation parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| Kali. | Saka. | Chaitrâdi. Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | (Southern.) | Brihaspati cycle (Northern) current at Mesha sankrânti. | Name of month. | Time of the preceding sankrânti expressed in Lunation parts (L.) | Time of the preceding sankrânti expressed in Tithis. | Time of the succeeding sankrânti expressed in Lunation parts (L.) | Time of the succeeding sankrânti expressed in Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 3916 | 737 | 872 | 221 | — | 814-15 | 27 Vijaya | | 4 Âshâḍha | 9935 | 29.805 | 807 | 2.421 |
| 3917 | 738 | 873 | 222 | — | 815-16 | 28 Jaya | | | | | | |
| 3918 | 739 | 874 | 223 | — | *816-17 | 29 Manmatha | | | | | | |
| 3919 | 740 | 875 | 224 | — | 817-18 | 30 Durmukha | | 2 Vaiśâkha | 9910 | 29.730 | 296 | 0.888 |
| 3920 | 741 | 876 | 225 | — | 818-19 | 31 Hemalamba | | | | | | |
| 3921 | 742 | 877 | 226 | — | 819-20 | 32 Vilamba | | 6 Bhâdrapada | 9821 | 29.463 | 251 | 0.753 |
| 3922 | 743 | 878 | 227 | — | *820-21 | 33 Vikârin | | | | | | |
| 3923 | 744 | 879 | 228 | — | 821-22 | 34 Śârvarin | | | | | | |
| 3924 | 745 | 880 | 229 | — | 822-23 | 35 Plava | | 4 Âshâḍha | 9482 | 28.446 | 340 | 1.020 |
| 3925 | 746 | 881 | 230 | — | 823-24 | 36 Śubhakrit[1] | | | | | | |
| 3926 | 747 | 882 | 231 | — | *824-25 | 38 Krodhin | | | | | | |
| 3927 | 748 | 883 | 232 | 0- 1 | 825-26 | 39 Viśvâvasu | | 3 Jyeshtha | 9773 | 29.319 | 403 | 1.209 |
| 3928 | 749 | 884 | 233 | 1- 2 | 826-27 | 40 Parâbhava | | | | | | |
| 3929 | 750 | 885 | 234 | 2- 3 | 827-28 | 41 Plavanga | | 7 Âśvina | 9740 | 29.220 | 51 | 0.153 |
| 3930 | 751 | 886 | 235 | 3- 4 | *828-29 | 42 Kîlaka | | | | | | |
| 3931 | 752 | 887 | 236 | 4- 5 | 829-30 | 43 Saumya | | | | | | |
| 3932 | 753 | 888 | 237 | 5- 6 | 830-31 | 44 Sâdhâraṇa | | 5 Śrâvaṇa | 9865 | 29.595 | 533 | 1.599 |
| 3933 | 754 | 889 | 238 | 6- 7 | 831-32 | 45 Virodhakrit | | | | | | |
| 3934 | 755 | 890 | 239 | 7- 8 | *832-33 | 46 Paridhâvin | | | | | | |
| 3935 | 756 | 891 | 240 | 8- 9 | 833-34 | 47 Pramâdin | | 4 Âshâḍha | 9920 | 29.760 | 770 | 2.310 |
| 3936 | 757 | 892 | 241 | 9-10 | 834-35 | 48 Ânanda | | | | | | 9. |
| 3937 | 758 | 893 | 242 | 10-11 | 835-36 | 49 Râkshasa | | | | | | |
| 3938 | 759 | 894 | 243 | 11-12 | *836-37 | 50 Anala | | 1 Chaitra | 9817 | 29.451 | 81 | 0.243 |
| 3939 | 760 | 895 | 244 | 12-13 | 837-38 | 51 Pingala | | | | | | |
| 3940 | 761 | 896 | 245 | 13-14 | 838-39 | 52 Kâlayukta | | 5 Śrâvaṇa | 9377 | 28.131 | 13 | 0.039 |
| 3941 | 762 | 897 | 246 | 14-15 | 839-40 | 53 Siddhârthin | | | | | | |
| 3942 | 763 | 898 | 247 | 15-16 | *840-41 | 54 Raudra | | | | | | |
| 3943 | 764 | 899 | 248 | 16-17 | 841-42 | 55 Durmati | | 4 Âshâḍha | 9449 | 28.347 | 316 | 0.948 |
| 3944 | 765 | 900 | 249 | 17-18 | 842-43 | 56 Dundubhi | | | | | | |
| 3945 | 766 | 901 | 250 | 18-19 | 843-44 | 57 Rudhirodgârin | | | | | | |
| 3946 | 767 | 902 | 251 | 19-20 | *844-45 | 58 Raktâksha | | 3 Jyeshtha | 9956 | 29.868 | 513 | 1.539 |
| 3947 | 768 | 903 | 252 | 20-21 | 845-46 | 59 Krodhana | | | | | | |

[1] Sobhana, No. 37, was suppressed.

# TABLE I.

(*Col.* 23) *a* = *Distance of moon from sun.* (*Col.* 24) *b* = *moon's mean anomaly.* (*Col.* 25) *c* = *sun's mean anomaly.*

| II. ADDED LUNAR MONTHS (continued.) | | | | | III. COMMENCEMENT OF THE | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean | | | | | Solar year. | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | |
| Name of month. | Time of the preceding saṅkrânti expressed in: Lunation parts. (*t*.) | Time of the preceding saṅkrânti expressed in: Tithis. | Time of the succeeding saṅkrânti expressed in: Lunation parts. (*t*.) | Time of the succeeding saṅkrânti expressed in: Tithis. | Day and Month A. D. | (Time of the Mesha saṅkrânti.) Week day | By the Ârya Siddhânta Gh | Pa | H | M | Day and Month A. D | Week day | At Sunrise on meridian of Ujjain. Moon's Age: Lunat. parts elapsed. (*t*.) | Tithis elapsed. | *a* | *b* | *c* | Kali |
| 8a | 9a | 10a | 11a | 12a | 13 | 14 | 15 | | 17 | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 3 Jyeshtha .... | 9915 | 29.745 | 222 | 0.667 | 21 Mar. (80) | 3 Tues. | 35 | 12 | 14 | 5 | 24 Feb. (55) | 6 Fri | 2 | .006 | 9999 | 769 | 210 | 3916 |
| .... | .... | .... | .... | .... | 21 Mar. (80) | 4 Wed. | 50 | 44 | 20 | 17 | 15 Mar. (74) | 5 Thur | 40 | .120 | 34 | 704 | 261 | 3917 |
| 11 Mâgha .... | 9750 | 29.251 | 58 | 0.173 | 21 Mar. (81) | 6 Fri | 6 | 15 | 2 | 30 | 3 Mar (63) | 2 Mon. | 3 | .009 | 9909 | 552 | 230 | 3918 |
| .... | .... | .... | .... | .... | 21 Mar (80) | 0 Sat | 21 | 46 | 8 | 42 | 21 Feb. (52) | 0 Sat | 323 | .969 | 124 | 435 | 202 | 3919 |
| .... | .... | .... | .... | .... | 21 Mar. (80) | 1 Sun | 37 | 17 | 14 | 55 | 11 Mar. (70) | 5 Thur | 81 | .243 | 9820 | 335 | 250 | 3920 |
| 8 Kârttika .... | 9893 | 29.679 | 200 | 0.601 | 21 Mar. (80) | 2 Mon | 52 | 49 | 21 | 7 | 1 Mar. (60) | 3 Tues | 312 | .936 | 34 | 218 | 222 | 3921 |
| .... | .... | .... | .... | .... | 21 Mar. (81) | 4 Wed. | 8 | 20 | 3 | 20 | 19 Mar. (79) | 2 Mon | 324 | .972 | 69 | 154 | 274 | 3922 |
| .... | .... | .... | .... | .... | 21 Mar. (80) | 5 Thur. | 23 | 51 | 9 | 32 | 8 Mar. (67) | 6 Fri. | 87 | .261 | 9945 | 2 | 243 | 3923 |
| 4 Âshâḍha .... | 9728 | 29.185 | 36 | 0.107 | 21 Mar. (80) | 6 Fri. | 39 | 22 | 15 | 45 | 26 Feb. (57) | 4 Wed. | 208 | .624 | 159 | 885 | 215 | 3924 |
| .... | .... | .... | .... | .... | 21 Mar. (80) | 0 Sat. | 54 | 54 | 21 | 57 | 17 Mar. (76) | 3 Tues. | 206 | .618 | 194 | 821 | 266 | 3925 |
| .... | .... | .... | .... | .... | 21 Mar. (81) | 2 Mon. | 10 | 25 | 4 | 10 | 5 Mar (65) | 0 Sat | 87 | .261 | 69 | 668 | 235 | 3926 |
| 1 Chaitra..... | 9871 | 29.614 | 179 | 0.536 | 21 Mar. (80) | 3 Tues. | 25 | 56 | 10 | 22 | 22 Feb. (53) | 4 Wed. | 76 | .228 | 9945 | 515 | 204 | 3927 |
| .... | .... | .... | .... | .... | 21 Mar. (80) | 4 Wed | 41 | 27 | 16 | 35 | 13 Mar. (72) | 3 Tues | 162 | .486 | 9980 | 452 | 256 | 3928 |
| 9 Mârgaśîrsha . | 9707 | 29.120 | 14 | 0.042 | 21 Mar (80) | 5 Thur | 56 | 59 | 22 | 47 | 2 Mar. (61) | 0 Sat | 131 | .393 | 9855 | 299 | 225 | 3929 |
| .... | .... | .... | .... | .... | 21 Mar. (81) | 0 Sat | 12 | 30 | 5 | 0 | 20 Mar (80) | 6 Fri | 171 | .513 | 9890 | 235 | 276 | 3930 |
| .... | .... | .... | .... | .... | 21 Mar (80) | 1 Sun | 28 | 1 | 11 | 12 | 9 Mar. (68) | 3 Tues | [1]—25 | —.075 | 9766 | 82 | 245 | 3931 |
| 6 Bhâdrapada.. | 9849 | 29.548 | 157 | 0.470 | 21 Mar. (80) | 2 Mon. | 43 | 32 | 17 | 25 | 27 Feb. (58) | 1 Sun. | 91 | .273 | 9980 | 965 | 217 | 3932 |
| .... | .... | .... | .... | | 21 Mar. (80) | 3 Tues | 59 | 4 | 23 | 37 | 18 Mar. (77) | 0 Sat | 73 | .219 | 15 | 901 | 269 | 3933 |
| .... | .... | .... | .... | .... | 21 Mar (81) | 5 Thur. | 14 | 35 | 5 | 50 | 7 Mar. (67) | 5 Thur | 232 | .696 | 229 | 785 | 240 | 3934 |
| 3 Jyeshtha .... | 9992 | 29.976 | 299 | 0.898 | 21 Mar. (80) | 6 Fri | 30 | 6 | 12 | 2 | 24 Feb (55) | 2 Mon | 144 | .432 | 105 | 632 | 210 | 3935 |
| .... | .... | .... | .... | .... | 21 Mar. (80) | 0 Sat | 45 | 37 | 18 | 15 | 15 Mar. (74) | 1 Sun | 221 | .663 | 139 | 568 | 261 | 3936 |
| 11 Mâgha...... | 9828 | 29.483 | 135 | 0.405 | 22 Mar. (81) | 2 Mon. | 1 | 9 | 0 | 27 | 4 Mar. (63) | 5 Thur | 226 | .678 | 15 | 415 | 230 | 3937 |
| .... | .... | .... | .... | .... | 21 Mar (81) | 3 Tues | 16 | 40 | 6 | 40 | 21 Feb (52) | 2 Mon | 174 | .522 | 9891 | 263 | 199 | 3938 |
| .... | .... | .... | .... | .... | 21 Mar. (80) | 4 Wed | 32 | 11 | 12 | 52 | 11 Mar. (70) | 1 Sun | 199 | .597 | 9926 | 198 | 251 | 3939 |
| 8 Kârttika .... | 9970 | 29.911 | 278 | 0.833 | 21 Mar. (80) | 5 Thur | 47 | 42 | 19 | 5 | 28 Feb (59) | 5 Thur | [1]—17 | —.051 | 9801 | 46 | 220 | 3940 |
| .... | .... | .... | .... | .... | 22 Mar. (81) | 0 Sat | 3 | 14 | 1 | 17 | 20 Mar. (79) | 5 Thur | 330 | .990 | 174 | 18 | 274 | 3941 |
| .... | .... | .... | .... | .... | 21 Mar. (81) | 1 Sun | 18 | 45 | 7 | 30 | 8 Mar (68) | 2 Mon | 86 | .268 | 50 | 865 | 243 | 3942 |
| 4 Âshâḍha .... | 9806 | 29.417 | 113 | 0.339 | 21 Mar. (80) | 2 Mon | 34 | 16 | 13 | 42 | 26 Feb (57) | 0 Sat | 267 | .801 | 265 | 749 | 215 | 3943 |
| .... | .... | .... | .... | .... | 21 Mar (80) | 3 Tues. | 49 | 47 | 19 | 55 | 17 Mar (76) | 6 Fri | 311 | .933 | 299 | 685 | 266 | 3944 |
| .... | .... | .... | .... | .... | 22 Mar (81) | 5 Thur | 5 | 19 | 2 | 7 | 6 Mar. (65) | 3 Tues. | 286 | .858 | 175 | 532 | 235 | 3945 |
| 1 Chaitra..... | 9948 | 29.845 | 256 | 0.767 | 21 Mar (81) | 6 Fri | 20 | 50 | 8 | 20 | 23 Feb (54) | 0 Sat | 289 | .867 | 51 | 379 | 205 | 3946 |
| .... | .... | .... | .... | | 21 Mar. (80) | 0 Sat | 36 | 21 | 14 | 32 | 12 Mar (71) | 5 Thur | 24 | .072 | 9747 | 279 | 253 | 3947 |

[1] See Text Art 101 above, para. 2.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR | | | | | | | | II. ADDED LUNAR MONTHS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| | | | | | | | | | Time of the preceding saṅkrânti expressed in | | Time of the succeeding saṅkrânti expressed in | |
| Kali. | Śaka. | Chaitrâdi Vikrama. | Mesbâdi (Solar) year in Bengal. | Kollam. | A. D. | (Southern.) | Bṛihaspati cycle (Northern) current at Mesha saṅkrânti | Name of month. | Lunation parts (*l.*) | Tithis. | Lunation parts (*l.*) | Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 3948 | 769 | 904 | 253 | 21-22 | 846-47 | 60 Kshaya | | 7 Āśvina | 9894 | 29.682 | 136 | 0.408 |
| 3949 | 770 | 905 | 254 | 22-23 | 847-48 | 1 Prabhava | | | | | | |
| 3950 | 771 | 906 | 255 | 23-24 | *848-49 | 2 Vibhava | | | | | | |
| 3951 | 772 | 907 | 256 | 24-25 | 849-50 | 3 Śukla | | 5 Śrāvaṇa | 9852 | 29.556 | 630 | 1.890 |
| 3952 | 773 | 908 | 257 | 25-26 | 850-51 | 4 Pramoda | | | | | | |
| 3953 | 774 | 909 | 258 | 26-27 | 851-52 | 5 Prajâpati | | | | | | |
| 3954 | 775 | 910 | 259 | 27-28 | *852-53 | 6 Aṅgiras | | 4 Āshāḍha | 9996 | 29.988 | 750 | 2.250 |
| 3955 | 776 | 911 | 260 | 28-29 | 853-54 | 7 Śrîmukha | | | | | | |
| 3956 | 777 | 912 | 261 | 29-30 | 854-55 | 8 Bhâva | | | | | | |
| 3957 | 778 | 913 | 262 | 30-31 | 855-56 | 9 Yuvan | | 1 Chaitra | 9827 | 29.481 | 162 | 0.486 |
| 3958 | 779 | 914 | 263 | 31-32 | *856-57 | 10 Dhâtri | | | | | | |
| 3959 | 780 | 915 | 264 | 32-33 | 857-58 | 11 Īśvara | | 5 Śrāvaṇa | 9406 | 28.218 | 142 | 0.426 |
| 3960 | 781 | 916 | 265 | 33-34 | 858-59 | 12 Bahudhânya | | | | | | |
| 3961 | 782 | 917 | 266 | 34-35 | 859-60 | 13 Pramâthin | | | | | | |
| 3962 | 783 | 918 | 267 | 35-36 | *860-61 | 14 Vikrama | | 4 Āshāḍha | 9491 | 28.473 | 281 | 0.843 |
| 3963 | 784 | 919 | 268 | 36-37 | 861-62 | 15 Vṛisha | | | | | | |
| 3964 | 785 | 920 | 269 | 37-38 | 862-63 | 16 Chitrabhânu | | | | | | |
| 3965 | 786 | 921 | 270 | 38-39 | 863-64 | 17 Subhânu | | 2 Vaiśākha | 9679 | 29.037 | 140 | 0.420 |
| 3966 | 787 | 922 | 271 | 39-40 | *864-65 | 18 Târaṇa | | | | | | |
| 3967 | 788 | 923 | 272 | 40-41 | 865-66 | 19 Pârthiva | | 6 Bhādrapada | 9642 | 28.926 | 92 | 0.276 |
| 3968 | 789 | 924 | 273 | 41-42 | 866-67 | 20 Vyaya | | | | | | |
| 3969 | 790 | 925 | 274 | 42-43 | 867-68 | 21 Sarvajit | | | | | | |
| 3970 | 791 | 926 | 275 | 43-44 | *868-69 | 22 Sarvadhârin | | 5 Śrāvaṇa | 9821 | 29.463 | 630 | 1.890 |
| 3971 | 792 | 927 | 276 | 44-45 | 869-70 | 23 Virodhin | | | | | | |
| 3972 | 793 | 928 | 277 | 45-46 | 870-71 | 24 Vikṛita | | | | | | |
| 3973 | 794 | 929 | 278 | 46-47 | 871-72 | 25 Khara | | 3 Jyeshṭha | 9616 | 28.848 | 163 | 0.489 |
| 3974 | 795 | 930 | 279 | 47-48 | *872-73 | 26 Nandana | | | | | | |
| 3975 | 796 | 931 | 280 | 48-49 | 873-74 | 27 Vijaya | | | | | | |
| 3976 | 797 | 932 | 281 | 49-50 | 874-75 | 28 Jaya | | 1 Chaitra | 9786 | 29.358 | 151 | 0.453 |
| 3977 | 798 | 933 | 282 | 50-51 | 875-76 | 29 Manmatha | | | | | | |
| 3978 | 799 | 934 | 283 | 51-52 | *876-77 | 30 Durmukha | | 5 Śrāvaṇa | 9365 | 28.095 | 170 | 0.510 |
| 3979 | 800 | 935 | 284 | 52-53 | 877-78 | 31 Hemalamba | | | | | | |

# TABLE I.

(*Col.* 23) *a* = *Distance of moon from sun.* (*Col.* 24) *b* = *moon's mean anomaly.* (*Col.* 25) *c* = *sun's mean anomaly.*

| II. ADDED LUNAR MONTHS (*continued.*) | | | | | III. COMMENCEMENT OF THE | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean. | | | | | Solar year. | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | |
| | Time of the preceding saṅkrānti expressed in | | Time of the succeeding saṅkrānti expressed in | | | (Time of the Mesha saṅkrānti.) | | | | | At Sunrise on meridian of Ujjain. | | | | | |
| | | | | | | | By the Ārya Siddhânta | | | | Moon's Age | | | | | |
| Name of month. | Lunation parts. (*t.*) | Tithis. | Lunation parts. (*t.*) | Tithis. | Day and Month A. D. | Week day. | Gh. Pa. | H. M. | Day and Month A. D. | Week day. | Lunat. parts elapsed. (*t.*) | Tithis elapsed. | *a* | *b* | *c* | Kali. |
| 8a | 9a | 10a | 11a | 12a | 13 | 14 | 15 | 17 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 9 Mārgaśīrsha .. | 9784 | 29.352 | 91 | 0.274 | 21 Mar. (80) | 1 Sun. | 51 52 | 20 45 | 2 Mar. (61) | 3 Tues. | 220 | .660 | 9961 | 102 | 225 | 3948 |
| | | | | | 22 Mar. (81) | 3 Tues. | 7 24 | 2 57 | 21 Mar. (80) | 2 Mon. | 218 | .654 | 9996 | 98 | 276 | 3949 |
| | | | | | 21 Mar. (81) | 4 Wed. | 22 55 | 9 10 | 9 Mar. (69) | 6 Fri. | ⊙—48 | —.[illegible] | 9871 | 940 | 246 | 3950 |
| 6 Bhādrapada .. | 9927 | 29.780 | 234 | 0.702 | 21 Mar. (80) | 5 Thur. | 38 26 | 15 22 | 27 Feb. (58) | 4 Wed. | 104 | .312 | 86 | 820 | 217 | 3951 |
| | | | | | 21 Mar. (80) | 6 Fri. | 53 57 | 21 35 | 18 Mar. (77) | 3 Tues. | 120 | .360 | 120 | 765 | 269 | 3952 |
| | | | | | 22 Mar. (81) | 1 Sun. | 9 29 | 3 47 | 7 Mar. (66) | 0 Sat. | 45 | .135 | 9996 | 612 | 238 | 3953 |
| 2 Vaiśākha .. | 9762 | 29.286 | 69 | 0.208 | 21 Mar. (81) | 2 Mon. | 25 0 | 10 0 | 24 Feb. (55) | 4 Wed. | 49 | .147 | 9872 | 450 | 207 | 3954 |
| | | | | | 21 Mar. (80) | 3 Tues. | 40 31 | 16 12 | 14 Mar. (73) | 3 Tues. | 135 | .405 | 9900 | 395 | 258 | 3955 |
| 11 Māgha ...... | 9905 | 29.714 | 212 | 0.637 | 21 Mar. (80) | 4 Wed. | 56 2 | 22 25 | 3 Mar. (62) | 0 Sat. | 63 | .189 | 9788 | 243 | 228 | 3956 |
| | | | | | 22 Mar. (81) | 6 Fri. | 11 34 | 4 37 | 21 Feb. (52) | 5 Thur. | 239 | .717 | 9998 | 196 | 200 | 3957 |
| | | | | | 21 Mar. (81) | 0 Sat. | 27 5 | 10 50 | 11 Mar. (71) | 4 Wed. | 225 | .675 | 31 | 62 | 251 | 3958 |
| 7 Āśvina .... | 9740 | 29.221 | 48 | 0.143 | 21 Mar. (80) | 1 Sun. | 42 36 | 17 2 | 28 Feb. (59) | 1 Sun. | ⊙—37 | —.[illegible] | 9907 | 909 | 220 | 3959 |
| | | | | | 21 Mar. (80) | 2 Mon. | 58 7 | 23 13 | 20 Mar. (79) | 1 Sun. | 325 | .975 | 280 | 882 | 274 | 3960 |
| | | | | | 22 Mar. (81) | 4 Wed. | 13 39 | 5 27 | 9 Mar. (68) | 5 Thur. | 157 | .471 | 156 | 729 | 243 | 3961 |
| 4 Āshāḍha .... | 9863 | 29.649 | 190 | 0.571 | 21 Mar. (81) | 5 Thur. | 29 10 | 11 40 | 26 Feb. (57) | 2 Mon. | 108 | .324 | 31 | 576 | 212 | 3962 |
| | | | | | 21 Mar. (80) | 6 Fri. | 44 41 | 17 52 | 16 Mar. (75) | 1 Sun. | 196 | .588 | 66 | 512 | 264 | 3963 |
| 12 Phālguna.... | 9718 | 29.155 | 26 | 0.077 | 22 Mar. (81) | 1 Sun. | 0 12 | 0 5 | 5 Mar. (64) | 5 Thur. | 191 | .573 | 9942 | 359 | 233 | 3964 |
| | | | | | 22 Mar. (81) | 2 Mon. | 15 44 | 6 17 | 22 Feb. (53) | 2 Mon. | 96 | .288 | 9818 | 206 | 202 | 3965 |
| | | | | | 21 Mar. (81) | 3 Tues. | 31 15 | 12 30 | 12 Mar. (72) | 1 Sun. | 101 | .303 | 9852 | 142 | 253 | 3966 |
| 9 Mārgaśīrsha .. | 9861 | 29.583 | 169 | 0.506 | 21 Mar. (80) | 4 Wed. | 46 46 | 18 42 | 2 Mar. (61) | 6 Fri. | 229 | .687 | 67 | 26 | 225 | 3967 |
| | | | | | 22 Mar. (81) | 6 Fri. | 2 17 | 0 55 | 21 Mar. (80) | 5 Thur. | 209 | .627 | 101 | 962 | 277 | 3968 |
| | | | | | 22 Mar. (81) | 0 Sat. | 17 49 | 7 7 | 10 Mar. (69) | 2 Mon. | ⊙—13 | —.[illegible] | 9977 | 809 | 246 | 3969 |
| 5 Śrāvaṇa .... | 9697 | 29.090 | 4 | 0.012 | 21 Mar. (81) | 1 Sun. | 33 20 | 13 20 | 28 Feb. (59) | 0 Sat. | 202 | .606 | 101 | 693 | 218 | 3970 |
| | | | | | 21 Mar. (80) | 2 Mon. | 48 51 | 19 32 | 18 Mar. (77) | 6 Fri. | 266 | .798 | 226 | 628 | 269 | 3971 |
| | | | | | 22 Mar. (81) | 4 Wed. | 4 22 | 1 45 | 7 Mar. (66) | 3 Tues. | 263 | .789 | 102 | 476 | 238 | 3972 |
| 2 Vaiśākha .... | 9839 | 29.518 | 147 | 0.440 | 22 Mar. (81) | 5 Thur. | 19 54 | 7 57 | 24 Feb. (55) | 0 Sat. | 245 | .735 | 9977 | 323 | 207 | 3973 |
| | | | | | 21 Mar. (81) | 6 Fri. | 35 25 | 14 10 | 14 Mar. (74) | 6 Fri. | 292 | .876 | 12 | 259 | 259 | 3974 |
| 11 Māgha...... | 9982 | 29.946 | 289 | 0.868 | 21 Mar. (80) | 0 Sat. | 50 56 | 20 22 | 3 Mar. (62) | 3 Tues. | 116 | .348 | 9888 | 106 | 228 | 3975 |
| | | | | | 22 Mar. (81) | 2 Mon. | 6 27 | 2 35 | 21 Feb. (52) | 1 Sun. | 236 | .708 | 102 | 990 | 200 | 3976 |
| | | | | | 22 Mar. (81) | 3 Tues. | 21 59 | 8 47 | 12 Mar. (71) | 0 Sat. | 213 | .639 | 137 | 926 | 251 | 3977 |
| 7 Āśvina ..... | 9814 | 29.453 | 125 | 0.375 | 21 Mar. (81) | 4 Wed. | 37 30 | 15 0 | 29 Feb. (60) | 4 Wed. | 15 | .045 | 12 | 773 | 220 | 3978 |
| | | | | | 21 Mar. (80) | 5 Thur. | 53 1 | 21 12 | 19 Mar. (78) | 3 Tues. | 53 | .159 | 47 | 709 | 272 | 3979 |

⊙ See Text Art 101 above, para 2.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR | | | | | | | | II. ADDED LUNAR MONTHS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Saṁvatsara | | True. | | | | |
| | | | | | | | | | Time of the preceding saṅkrânti expressed in | | Time of the succeeding saṅkrânti expressed in | |
| Kali. | Saka. | Chaitrâdi Vikrama | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | (Southern.) | Brihaspati cycle (Northern) current at Mesha saṅkrânti | Name of month | Lunation parts (*l.*) | Tithis. | Lunation parts (*l.*) | Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 3980 | 801 | 936 | 285 | 53-54 | 878- 79 | ...... 32 Vilamba ...... | | ...... | ...... | ...... | ...... | ...... |
| 3981 | 802 | 937 | 286 | 54-55 | 879- 80 | ...... 33 Vikârin ...... | | 4 Âshâḍha | 9633 | 28.899 | 316 | 0.948 |
| 3982 | 803 | 938 | 287 | 55-56 | *880- 81 | ...... 34 Śârvari ...... | | ...... | ...... | ...... | ...... | ...... |
| 3983 | 804 | 939 | 288 | 56-57 | 881- 82 | ...... 35 Plava ...... | | ...... | ...... | ...... | ...... | ...... |
| 3984 | 805 | 940 | 289 | 57-58 | 882- 83 | ...... 36 Śubhakrit ...... | | 2 Vaiśâkha ... | 9694 | 29.082 | 241 | 0.723 |
| 3985 | 806 | 941 | 290 | 58-59 | 883- 84 | ...... 37 Śobhana ...... | | ...... | ...... | ...... | ...... | ...... |
| 3986 | 807 | 942 | 291 | 59-60 | *884- 85 | ...... 38 Krodhin ...... | | 6 Bhâdrapada | 9702 | 29.106 | 243 | 0.729 |
| 3987 | 808 | 943 | 292 | 60-61 | 885- 86 | ...... 39 Viśvâvasu ...... | | ...... | ...... | ...... | ...... | ...... |
| 3988 | 809 | 944 | 293 | 61-62 | 886- 87 | ...... 40 Parâbhava ...... | | ...... | ...... | ...... | ...... | ...... |
| 3989 | 810 | 945 | 294 | 62-63 | 887- 88 | ...... 41 Plavaṅga ...... | | 5 Śrâvaṇa ... | 9825 | 29.475 | *588 | 1.764 |
| 3990 | 811 | 946 | 295 | 63-64 | *888- 89 | ...... 42 Kîlaka ...... | | ...... | ...... | ...... | ...... | ...... |
| 3991 | 812 | 947 | 296 | 64-65 | 889- 90 | ...... 43 Saumya ...... | | ...... | ...... | ...... | ...... | ...... |
| 3992 | 813 | 948 | 297 | 65-66 | 890- 91 | ...... 44 Sâdhâraṇa ...... | | 3 Jyeshṭha ... | 9753 | 29.259 | 359 | 1.077 |
| 3993 | 814 | 949 | 298 | 66-67 | 891- 92 | ...... 45 Virodhakrit ...... | | ...... | ...... | ...... | ...... | ...... |
| 3994 | 815 | 950 | 299 | 67-68 | *892- 93 | ...... 46 Paridhâvin ...... | | 8 Kârttika ...<br>9 *Mârgaś.(Ksh.)* | 9974<br>8 | 29.922<br>0.024 | 8<br>9912 | 0.024<br>29.736 |
| 3995 | 816 | 951 | 300 | 68-69 | 893- 94 | ...... 47 Pramâdin ...... | | 1 Chaitra ... | 9780 | 29.340 | 111 | 0.333 |
| 3996 | 817 | 952 | 301 | 69-70 | 894- 95 | ...... 48 Ânanda ...... | | ...... | ...... | ...... | ...... | ...... |
| 3997 | 818 | 953 | 302 | 70-71 | 895- 96 | ...... 49 Râkshasa ...... | | 5 Śrâvaṇa ... | 9347 | 28.041 | 132 | 0.396 |
| 3998 | 819 | 954 | 303 | 71-72 | *896- 97 | ...... 50 Anala ...... | | ...... | ...... | ...... | ...... | ...... |
| 3999 | 820 | 955 | 304 | 72-73 | 897- 98 | ...... 51 Piṅgala ...... | | ...... | ...... | ...... | ...... | ...... |
| 4000 | 821 | 956 | 305 | 73-74 | 898- 99 | ...... 52 Kâlayukta ...... | | 4 Âshâḍha ... | 9829 | 29.487 | 452 | 1.356 |
| 4001 | 822 | 957 | 306 | 74-75 | 899-900 | ...... 53 Siddhârthin ...... | | ...... | ...... | ...... | ...... | ...... |
| 4002 | 823 | 958 | 307 | 75-76 | *900- 1 | ...... 54 Raudra ...... | | ...... | ...... | ...... | ...... | ...... |
| 4003 | 824 | 959 | 308 | 76-77 | 901- 2 | ...... 55 Durmati ...... | | 2 Vaiśâkha ... | 9654 | 28.962 | 250 | 0.750 |
| 4004 | 825 | 960 | 309 | 77-78 | 902- 3 | ...... 56 Dundubhi ...... | | ...... | ...... | ...... | ...... | ...... |
| 4005 | 826 | 961 | 310 | 78-79 | 903- 4 | ...... 57 Rudhirodgârin ...... | | 6 Bhâdrapada | 9671 | 29.013 | 292 | 0.876 |
| 4006 | 827 | 962 | 311 | 79-80 | *904- 5 | ...... 58 Raktâksha ...... | | ...... | ...... | ...... | ...... | ...... |
| 4007 | 828 | 963 | 312 | 80-81 | 905- 6 | ...... 59 Krodhana ...... | | ...... | ...... | ...... | ...... | ...... |
| 4008 | 829 | 964 | 313 | 81-82 | 906- 7 | ...... 60 Kshaya ...... | | 5 Śrâvaṇa ... | 9930 | 29.790 | 591 | 1.773 |
| 4009 | 830 | 965 | 314 | 82-83 | 907- 8 | ...... 1 Prabhava ...... | | ...... | ...... | ...... | ...... | ...... |
| 4010 | 831 | 966 | 315 | 83-84 | *908- 9 | ...... 2 Vibhava 1) ...... | | ...... | ...... | ...... | ...... | ...... |

1) Śukla No. 3 was suppressed in the north, but by southern reckoning there has been no suppression since this date.

# TABLE I.

(Col. 23) *a* = *Distance of moon from sun.* (Col. 24) *b* = *moon's mean anomaly.* (Col. 25) *c* = *sun's mean anomaly.*

| II. ADDED LUNAR MONTHS (continued.) | | | | | III. COMMENCEMENT OF THE | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean. | | | | | Solar year | | | | Luni-Solar year. (Civil day of Chaitra Sukla 1st.) | | | | | | | Kali. |
| Name of month. | Time of the preceding sankrânti expressed in Lunation parts (*t.*) | Time of the preceding sankrânti expressed in Tithis. | Time of the succeeding sankrânti expressed in Lunation parts (*t.*) | Time of the succeeding sankrânti expressed in Tithis. | Day and Month A. D. | (Time of the Mesha sankrânti.) Week day. | By the Ârya Siddhânta. Gh. Pa. | By the Ârya Siddhânta. H. M. | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain: Moon's Age. Lunat. parts elapsed. (*t.*) | Moon's Age. Tithis elapsed. | *a.* | *b.* | *c.* | |
| 8a | 9a | 10a | 11a | 12a | 13 | 14 | 15 | 17 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| ........ | | | | | 22 Mar. (81) | 0 Sat. | 8 32 | 3 25 | 8 Mar. (67) | 0 Sat. | 14 | .042 | 9923 | 556 | 241 | 3980 |
| 6 Âshâḍha | 9960 | 29.881 | 268 | 0.803 | 22 Mar. (81) | 1 Sun. | 24 6 | 9 37 | 26 Feb. (57) | 5 Thur. | 332 | .996 | 137 | 439 | 212 | 3981 |
| ........ | ... | ...... | | ...... | 21 Mar. (81) | 2 Mon. | 39 35 | 15 50 | 15 Mar. (75) | 3 Tues. | 91 | .273 | 9833 | 339 | 261 | 3982 |
| 12 Phâlguna | 9796 | 29.387 | 103 | 0.309 | 21 Mar. (80) | 3 Tues. | 55 6 | 22 2 | 5 Mar. (64) | 1 Sun. | 325 | .975 | 47 | 223 | 233 | 3983 |
| ........ | ... | ...... | | | 22 Mar. (81) | 5 Thur. | 10 37 | 4 15 | 22 Feb. (53) | 5 Thur. | 126 | .378 | 9923 | 70 | 202 | 3984 |
| ........ | ... | ...... | ... | ...... | 22 Mar. (81) | 6 Fri. | 26 9 | 10 27 | 13 Mar. (72) | 4 Wed. | 103 | .309 | 9958 | 6 | 254 | 3985 |
| 9 Mârgaśîrsha | 9938 | 29.815 | 246 | 0.737 | 21 Mar. (81) | 0 Sat. | 41 40 | 16 40 | 2 Mar. (62) | 2 Mon. | 223 | .669 | 172 | 890 | 226 | 3986 |
| ........ | ... | | ... | ...... | 21 Mar. (80) | 1 Sun. | 57 11 | 22 52 | 21 Mar. (80) | 1 Sun. | 224 | .672 | 207 | 825 | 277 | 3987 |
| ........ | ... | ...... | ... | ...... | 22 Mar. (81) | 3 Tues. | 12 42 | 5 5 | 10 Mar. (69) | 5 Thur. | 99 | .297 | 83 | 673 | 246 | 3988 |
| 5 Śrâvaṇa ⊕ | 9774 | 29.322 | 81 | 0.244 | 22 Mar. (81) | 4 Wed. | 28 14 | 11 17 | 27 Feb. (58) | 2 Mon. | 82 | .246 | 9958 | 520 | 215 | 3989 |
| ........ | ... | | ... | ...... | 21 Mar. (81) | 5 Thur. | 43 45 | 17 30 | 17 Mar. (77) | 1 Sun. | 172 | .516 | 9993 | 456 | 266 | 3990 |
| ........ | ... | ...... | ... | ...... | 21 Mar. (80) | 6 Fri. | 59 16 | 23 42 | 6 Mar. (65) | 5 Thur. | 141 | .423 | 9809 | 303 | 236 | 3991 |
| 2 Vaiśâkha | 9917 | 29.750 | 224 | 0.672 | 22 Mar. (81) | 1 Sun. | 14 47 | 5 55 | 23 Feb. (54) | 2 Mon. | ⊕ −4 | −.[illegible] | 9744 | 150 | 205 | 3992 |
| | | | ... | | 22 Mar. (81) | 2 Mon. | 30 19 | 12 7 | 14 Mar. (73) | 1 Sun. | ⊕ −[illegible] | −.[illegible] | 9779 | 86 | 256 | 3993 |
| 10 Pausha | 9752 | 29.256 | 59 | 0.178 | 21 Mar. (81) | 3 Tues. | 45 50 | 18 20 | 3 Mar. (63) | 6 Fri. | 7 | .021 | 9993 | 970 | 228 | 3994 |
| ........ | ... | ...... | ... | | 22 Mar. (81) | 5 Thur. | 1 21 | 0 32 | 21 Feb. (52) | 4 Wed. | 239 | .717 | 208 | 853 | 200 | 3995 |
| ........ | | | ... | ...... | 22 Mar. (81) | 6 Fri. | 16 52 | 6 45 | 12 Mar. (71) | 3 Tues. | 246 | .738 | 242 | 789 | 251 | 3996 |
| 7 Âśvina | 9895 | 29.684 | 202 | 0.606 | 22 Mar. (81) | 0 Sat. | 32 24 | 12 57 | 1 Mar. (60) | 0 Sat. | 153 | .459 | 118 | 636 | 220 | 3997 |
| ........ | ... | ... | ... | | 21 Mar. (81) | 1 Sun. | 47 55 | 19 10 | 19 Mar. (79) | 6 Fri. | 230 | .690 | 153 | 572 | 272 | 3998 |
| ........ | | | ... | ...... | 22 Mar. (81) | 3 Tues. | 3 26 | 1 22 | 8 Mar. (67) | 3 Tues. | 238 | .714 | 28 | 420 | 241 | 3999 |
| 3 Jyeshṭha | 9730 | 29.191 | 38 | 0.113 | 22 Mar. (81) | 4 Wed. | 18 57 | 7 35 | 25 Feb. (56) | 0 Sat. | 285 | .855 | 9904 | 267 | 210 | 4000 |
| ........ | | ...... | | | 22 Mar. (81) | 5 Thur. | 34 29 | 13 47 | 16 Mar. (75) | 6 Fri. | 213 | .639 | 9939 | 203 | 261 | 4001 |
| 12 Phâlguna | 9873 | 29.619 | 180 | 0.541 | 21 Mar. (81) | 6 Fri. | 50 0 | 20 0 | 4 Mar. (64) | 3 Tues. | ⊕ −1 | −.[illegible] | 9814 | 50 | 231 | 4002 |
| ........ | ... | ...... | | | 22 Mar. (81) | 1 Sun. | 5 31 | 2 12 | 22 Feb. (53) | 1 Sun. | 114 | .342 | 29 | 933 | 202 | 4003 |
| ........ | ... | ...... | | ... | 22 Mar. (81) | 2 Mon. | 21 2 | 8 25 | 13 Mar. (72) | 0 Sat. | 101 | .303 | 63 | 870 | 254 | 4004 |
| 8 Kârttika | 9708 | 29.125 | 16 | 0.047 | 22 Mar. (81) | 3 Tues. | 36 34 | 14 37 | 3 Mar. (62) | 5 Thur. | 278 | .834 | 278 | 753 | 226 | 4005 |
| ........ | | | ... | | 21 Mar. (81) | 4 Wed. | 52 5 | 20 50 | 21 Mar. (81) | 4 Wed. | 324 | .972 | 312 | 689 | 277 | 4006 |
| ........ | ... | ...... | ... | ...... | 22 Mar. (81) | 6 Fri. | 7 36 | 3 2 | 10 Mar. (69) | 1 Sun. | 298 | .894 | 188 | 536 | 246 | 4007 |
| 5 Śrâvaṇa | 9851 | 29.553 | 158 | 0.475 | 22 Mar. (81) | 0 Sat. | 23 7 | 9 15 | 27 Feb. (58) | 5 Thur. | 299 | .897 | 64 | 383 | 215 | 4008 |
| ........ | ... | ...... | ... | | 22 Mar. (81) | 1 Sun. | 38 39 | 15 27 | 17 Mar. (76) | 3 Tues. | 36 | .108 | 9760 | 283 | 264 | 4009 |
| ........ | ... | | ... | | 21 Mar. (81) | 2 Mon. | 54 10 | 21 40 | 6 Mar. (66) | 1 Sun. | 235 | .705 | 9974 | 167 | 236 | 4010 |

⊕ See Text, Art. 101 above, para. 2.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR | | | | | | | | II. ADDED LUNAR MONTHS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara | | True | | | | |
| | | | | | | | | | Time of the preceding sankrânti expressed in | | Time of the succeeding sankrânti expressed in | |
| Kali. | Saka. | Chaitrâdi Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | Luni-Solar cycle. (Southern.) | Bṛihaspati cycle (Northern) current at Mesha sankrânti | Name of month | Lunation parts (l.) | Tithis. | Lunation parts (l.) | Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4011 | 832 | 967 | 316 | 84- 85 | 909-10 | 3 Śukla | 4 Pramoda [1]) | 3 Jyeshṭha | 9788 | 29.364 | 496 | 1.488 |
| 4012 | 833 | 968 | 317 | 85- 86 | 910-11 | 4 Pramoda | 5 Prajâpati | ... | ... | ... | ... | ... |
| 4013 | 834 | 969 | 318 | 86- 87 | 911-12 | 5 Prajâpati | 6 Angiras | 7 Âśvina<br>10 *Pausha (Ksh.)* | 9818<br>198 | 29.454<br>0.594 | 131<br>9947 | 0.393<br>29.841 |
| 4014 | 835 | 970 | 319 | 87- 88 | *912-13 | 6 Angiras | 7 Śrîmukha | 1 Chaitra | 9865 | 29.595 | 125 | 0.375 |
| 4015 | 836 | 971 | 320 | 88- 89 | 913-14 | 7 Śrîmukha | 8 Bhâva | ... | ... | ... | ... | ... |
| 4016 | 837 | 972 | 321 | 89- 90 | 914-15 | 8 Bhâva | 9 Yuvan | 5 Śrâvaṇa | 9416 | 28.248 | 112 | 0.336 |
| 4017 | 838 | 973 | 322 | 90- 91 | 915-16 | 9 Yuvan | 10 Dhâtri | ... | ... | ... | ... | ... |
| 4018 | 839 | 974 | 323 | 91- 92 | *916-17 | 10 Dhâtṛi | 11 Îśvara | ... | ... | ... | ... | ... |
| 4019 | 840 | 975 | 324 | 92- 93 | 917-18 | 11 Îśvara | 12 Bahudhânya | 4 Âshâḍha | 9967 | 29.901 | 646 | 1.938 |
| 4020 | 841 | 976 | 325 | 93- 94 | 918-19 | 12 Bahudhânya | 13 Pramâthin | ... | ... | ... | ... | ... |
| 4021 | 842 | 977 | 326 | 94- 95 | 919-20 | 13 Pramâthin | 14 Vikrama | ... | ... | ... | ... | ... |
| 4022 | 843 | 978 | 327 | 95- 96 | *920-21 | 14 Vikrama | 15 Vṛisha | 2 Vaiśâkha | 9642 | 28.926 | 206 | 0.618 |
| 4023 | 844 | 979 | 328 | 96- 97 | 921-22 | 15 Vṛisha | 16 Chitrabhânu | ... | ... | ... | ... | ... |
| 4024 | 845 | 980 | 329 | 97- 98 | 922-23 | 16 Chitrabhânu | 17 Subhânu | 6 Bhâdrapada | 9643 | 28.929 | 266 | 0.798 |
| 4025 | 846 | 981 | 330 | 98- 99 | 923-24 | 17 Subhânu | 18 Târaṇa | ... | ... | ... | ... | ... |
| 4026 | 847 | 982 | 331 | 99-100 | *924-25 | 18 Târaṇa | 19 Pârthiva | ... | ... | ... | ... | ... |
| 4027 | 848 | 983 | 332 | 100- 1 | 925-26 | 19 Pârthiva | 20 Vyaya | 4 Âshâḍha | 9480 | 28.440 | 113 | 0.339 |
| 4028 | 849 | 984 | 333 | 101- 2 | 926-27 | 20 Vyaya | 21 Sarvajit | ... | ... | ... | ... | ... |
| 4029 | 850 | 985 | 334 | 102- 3 | 927-28 | 21 Sarvajit | 22 Sarvadhârin | ... | ... | ... | ... | ... |
| 4030 | 851 | 986 | 335 | 103- 4 | *928-29 | 22 Sarvadhârin | 23 Virodhin | 3 Jyeshṭha | 9753 | 29.259 | 530 | 1.590 |
| 4031 | 852 | 987 | 336 | 104- 5 | 929-30 | 23 Virodhin | 24 Vikṛita | ... | ... | ... | ... | ... |
| 4032 | 853 | 988 | 337 | 105- 6 | 930-31 | 24 Vikṛita | 25 Khara | 7 Âśvina | 9813 | 29.439 | 192 | 0.576 |
| 4033 | 854 | 989 | 338 | 106- 7 | 931-32 | 25 Khara | 26 Nandana | ... | ... | ... | ... | ... |
| 4034 | 855 | 990 | 339 | 107- 8 | *932-33 | 26 Nandana | 27 Vijaya | ... | ... | ... | ... | ... |
| 4035 | 856 | 991 | 340 | 108- 9 | 933-34 | 27 Vijaya | 28 Jaya | 5 Śrâvaṇa | 9579 | 28.737 | 180 | 0.540 |
| 4036 | 857 | 992 | 341 | 109- 10 | 934-35 | 28 Jaya | 29 Manmatha | ... | ... | ... | ... | ... |
| 4037 | 858 | 993 | 342 | 110- 11 | 935-36 | 29 Manmatha | 30 Durmukha | ... | ... | ... | ... | ... |
| 4038 | 859 | 994 | 343 | 111- 12 | *936-37 | 30 Durmukha | 31 Hemalamba | 3 Jyeshṭha | 9302 | 27.906 | 37 | 0.111 |
| 4039 | 860 | 995 | 344 | 112- 13 | 937-38 | 31 Hemalamba | 32 Vilamba | ... | ... | ... | ... | ... |
| 4040 | 861 | 996 | 345 | 113- 14 | 938-39 | 32 Vilamba | 33 Vikârin | ... | ... | ... | ... | ... |
| 4041 | 862 | 997 | 346 | 114- 15 | 939-40 | 33 Vikârin | 34 Śârvari | 2 Vaiśâkha | 9724 | 29.172 | 204 | 0.612 |
| 4042 | 863 | 998 | 347 | 115- 16 | *940-41 | 34 Śârvari | 35 Plava | ... | ... | ... | ... | ... |

[1]) See note 1, last page.

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

| II. ADDED LUNAR MONTHS (continued.) | | | | | III. COMMENCEMENT OF THE | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean. | | | | | Solar year. | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | Kali. |
| Name of month. | Time of the preceding saṅkrânti expressed in | | Time of the succeeding saṅkrânti expressed in | | Day and Month A. D. | (Time of the Mesha saṅkrânti.) | | | | | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. | | | | | |
| | | | | | | Week day. | By the Ârya Siddhânta. | | | | | | Moon's Age. | | a. | b. | c. | |
| | Lunation parts (*t.*) | Tithis. | Lunation parts (*t.*) | Tithis. | | | Gh. | Pa. | H. | M. | | | Lunat. parts elapsed. (*t.*) | Tithis elapsed. | | | | |
| 8a | 9a | 10a | 11a | 12a | 13 | 14 | 15 | | 17 | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 2 Vaiśâkha.... | 9994 | 29.982 | 301 | 0.904 | 22 Mar. (81) | 4 Wed. | 9 | 41 | 3 | 52 | 23 Feb. (54) | 5 Thur. | 4 | .012 | 9850 | 14 | 205 | 4011 |
| ............ | .... | ..... | ..... | ..... | 22 Mar. (81) | 5 Thur. | 25 | 12 | 10 | 5 | 14 Mar. (73) | 4 Wed. | ⊙−19 | −.057 | 9885 | 950 | 256 | 4012 |
| 10 Pausha.... | 9829 | 29.486 | 137 | 0.410 | 22 Mar. (81) | 6 Fri. | 40 | 44 | 16 | 17 | 4 Mar. (63) | 2 Mon. | 117 | .351 | 99 | 833 | 226 | 4013 |
| ............ | .... | ..... | ..... | ..... | 21 Mar. (81) | 0 Sat. | 56 | 15 | 22 | 30 | 22 Feb. (53) | 0 Sat. | 319 | .957 | 313 | 717 | 200 | 4014 |
| ............ | .... | ..... | ..... | ..... | 22 Mar. (81) | 2 Mon. | 11 | 46 | 4 | 42 | 11 Mar. (70) | 5 Thur. | 56 | .168 | 9 | 616 | 249 | 4015 |
| 7 Âśvina.... | 9972 | 29.916 | 279 | 0.838 | 22 Mar. (81) | 3 Tues. | 27 | 17 | 10 | 55 | 28 Feb. (59) | 2 Mon. | 57 | .171 | 9885 | 464 | 218 | 4016 |
| ............ | .... | ..... | ..... | ..... | 22 Mar. (81) | 4 Wed. | 42 | 49 | 17 | 7 | 19 Mar. (78) | 1 Sun. | 144 | .432 | 9920 | 400 | 269 | 4017 |
| ............ | .... | ..... | ..... | ..... | 21 Mar. (81) | 5 Thur. | 58 | 20 | 23 | 20 | 7 Mar. (67) | 5 Thur. | 75 | .225 | 9795 | 247 | 238 | 4018 |
| 3 Jyeshṭha.... | 9807 | 29.422 | 115 | 0.344 | 22 Mar. (81) | 0 Sat. | 13 | 51 | 5 | 32 | 25 Feb. (56) | 3 Tues. | 254 | .762 | 10 | 130 | 210 | 4019 |
| ............ | .... | ..... | ..... | ..... | 22 Mar. (81) | 1 Sun. | 29 | 22 | 11 | 45 | 16 Mar. (75) | 2 Mon. | 242 | .726 | 44 | 66 | 262 | 4020 |
| 12 Phâlguna.... | 9950 | 29.851 | 258 | 0.773 | 22 Mar. (81) | 2 Mon. | 44 | 54 | 17 | 57 | 5 Mar. (64) | 6 Fri. | ⊙−12 | −.036 | 9920 | 914 | 231 | 4021 |
| ............ | .... | ..... | ..... | ..... | 22 Mar. (82) | 4 Wed. | 0 | 25 | 0 | 10 | 23 Feb. (54) | 4 Wed. | 143 | .429 | 134 | 797 | 203 | 4022 |
| ............ | .... | ..... | ..... | ..... | 22 Mar. (81) | 5 Thur. | 15 | 56 | 6 | 22 | 13 Mar. (72) | 3 Tues. | 171 | .513 | 169 | 733 | 254 | 4023 |
| 8 Kârttika.... | 9786 | 29.357 | 93 | 0.279 | 22 Mar. (81) | 6 Fri. | 31 | 27 | 12 | 35 | 2 Mar. (61) | 0 Sat. | 118 | .354 | 45 | 580 | 223 | 4024 |
| ............ | .... | ..... | ..... | ..... | 22 Mar. (81) | 0 Sat. | 46 | 59 | 18 | 47 | 21 Mar. (80) | 6 Fri. | 205 | .615 | 79 | 516 | 275 | 4025 |
| ............ | .... | ..... | ..... | ..... | 22 Mar. (82) | 2 Mon. | 2 | 30 | 1 | 0 | 9 Mar. (69) | 3 Tues. | 201 | .603 | 9955 | 364 | 244 | 4026 |
| 5 Śrâvaṇa.... | 9928 | 29.785 | 236 | 0.707 | 22 Mar. (81) | 3 Tues. | 18 | 1 | 7 | 12 | 26 Feb. (57) | 0 Sat. | 109 | .327 | 9831 | 211 | 213 | 4027 |
| ............ | .... | ..... | ..... | ..... | 22 Mar. (81) | 4 Wed. | 33 | 32 | 13 | 25 | 17 Mar. (76) | 6 Fri. | 116 | .348 | 9865 | 147 | 264 | 4028 |
| ............ | .... | ..... | ..... | ..... | 22 Mar. (81) | 5 Thur. | 49 | 4 | 19 | 37 | 7 Mar. (66) | 4 Wed. | 246 | .738 | 60 | 30 | 236 | 4029 |
| 1 Chaitra.... | 9764 | 29.291 | 71 | 0.213 | 22 Mar. (82) | 0 Sat. | 4 | 35 | 1 | 50 | 24 Feb. (55) | 1 Sun. | ⊙ −[illegible] | −.[illegible] | 9935 | 877 | 205 | 4030 |
| ............ | .... | ..... | ..... | ..... | 22 Mar. (81) | 1 Sun. | 20 | 6 | 8 | 2 | 14 Mar. (73) | 0 Sat. | 2 | .006 | 9990 | 813 | 257 | 4031 |
| 10 Pausha.... | 9907 | 29.720 | 214 | 0.642 | 22 Mar. (81) | 2 Mon. | 35 | 37 | 14 | 15 | 4 Mar. (63) | 5 Thur. | 212 | .636 | 204 | 697 | 228 | 4032 |
| ............ | .... | ..... | ..... | ..... | 22 Mar. (81) | 3 Tues. | 51 | 9 | 20 | 27 | 23 Mar. (82) | 4 Wed. | 276 | .828 | 239 | 633 | 280 | 4033 |
| ............ | .... | ..... | ..... | ..... | 22 Mar. (82) | 5 Thur. | 6 | 40 | 2 | 40 | 11 Mar. (71) | 1 Sun. | 272 | .816 | 115 | 480 | 249 | 4034 |
| 6 Bhâdrapada.... | 9742 | 29.226 | 49 | 0.148 | 22 Mar. (81) | 6 Fri. | 22 | 11 | 8 | 52 | 28 Feb. (59) | 5 Thur. | 256 | .768 | 9991 | 327 | 218 | 4035 |
| ............ | .... | ..... | ..... | ..... | 22 Mar. (81) | 0 Sat. | 37 | 42 | 15 | 5 | 19 Mar. (78) | 4 Wed. | 305 | .915 | 25 | 263 | 269 | 4036 |
| ............ | .... | ..... | ..... | ..... | 22 Mar. (81) | 1 Sun. | 53 | 14 | 21 | 17 | 8 Mar. (67) | 1 Sun. | 131 | .393 | 9901 | 110 | 239 | 4037 |
| 3 Jyeshṭha.... | 9885 | 29.654 | 192 | 0.576 | 22 Mar. (82) | 3 Tues. | 8 | 45 | 3 | 30 | 26 Feb. (57) | 6 Fri. | 252 | .756 | 115 | 994 | 211 | 4038 |
| ............ | .... | ..... | ..... | ..... | 22 Mar. (81) | 4 Wed. | 24 | 16 | 9 | 42 | 16 Mar. (75) | 5 Thur. | 231 | .693 | 150 | 930 | 262 | 4039 |
| 11 Mâgha.... | 9720 | 29.160 | 28 | 0.083 | 22 Mar. (81) | 5 Thur. | 39 | 47 | 15 | 55 | 5 Mar. (64) | 2 Mon. | 28 | .084 | 26 | 777 | 231 | 4040 |
| ............ | .... | ..... | ..... | ..... | 22 Mar. (81) | 6 Fri. | 55 | 19 | 22 | 7 | 23 Feb. (54) | 0 Sat. | 264 | .792 | 240 | 661 | 203 | 4041 |
| ............ | .... | ..... | ..... | ..... | 22 Mar. (82) | 1 Sun. | 10 | 50 | 4 | 20 | 12 Mar. (72) | 5 Thur. | 23 | .069 | 9936 | 560 | 252 | 4042 |

⊙ See Text Art. 101 above, para. 2.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| Kali. | Śaka. | Chaitrâdi Vikrama. | Mêshâdi (Solar) year in Bengal. | Kollam. | A. D. | Luni-Solar cycle. (Southern.) | Bṛihaspati cycle (Northern) current at Mesha saṅkrânti. | Name of month. | Time of the preceding saṅkrânti expressed in Lunation parts (t.) | Time of the preceding saṅkrânti expressed in Tithis. | Time of the succeeding saṅkrânti expressed in Lunation parts (t.) | Time of the succeeding saṅkrânti expressed in Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4043 | 864 | 999 | 348 | 116-17 | 941-42 | 35 Plava | 36 Śubhakṛit | 6 Bhâdrapada | 9677 | 29.031 | 233 | 0.699 |
| 4044 | 865 | 1000 | 349 | 117-18 | 942-43 | 36 Śubhakṛit | 37 Śobhana | | | | | |
| 4045 | 866 | 1001 | 350 | 118-19 | 943-44 | 37 Śobhana | 38 Krodhin | | | | | |
| 4046 | 867 | 1002 | 351 | 119-20 | *944-45 | 38 Krodhin | 39 Viśvâvasu | 4 Âshâḍha | 9581 | 28.743 | 298 | 0.894 |
| 4047 | 868 | 1003 | 352 | 120-21 | 945-46 | 39 Viśvâvasu | 40 Parâbhava | | | | | |
| 4048 | 869 | 1004 | 353 | 121-22 | 946-47 | 40 Parâbhava | 41 Plavaṅga | | | | | |
| 4049 | 870 | 1005 | 354 | 122-23 | 947-48 | 41 Plavaṅga | 42 Kîlaka | 3 Jyeshṭha | 9727 | 29.181 | 495 | 1.485 |
| 4050 | 871 | 1006 | 355 | 123-24 | *948-49 | 42 Kîlaka | 43 Saumya | | | | | |
| 4051 | 872 | 1007 | 356 | 124-25 | 949-50 | 43 Saumya | 44 Sâdhâraṇa | 7 Âśvina | 9768 | 29.304 | 167 | 0.501 |
| 4052 | 873 | 1008 | 357 | 125-26 | 950-51 | 44 Sâdhâraṇa | 45 Virodhakṛit | | | | | |
| 4053 | 874 | 1009 | 358 | 126-27 | 951-52 | 45 Virodhakṛit | 46 Paridhâvin | | | | | |
| 4054 | 875 | 1010 | 359 | 127-28 | *952-53 | 46 Paridhâvi | 47 Pramâdin | 5 Śrâvaṇa | 9773 | 29.319 | 340 | 1.020 |
| 4055 | 876 | 1011 | 360 | 128-29 | 953-54 | 47 Pramâdin | 48 Ânanda | | | | | |
| 4056 | 877 | 1012 | 361 | 129-30 | 954-55 | 48 Ânanda | 49 Râkshasa | | | | | |
| 4057 | 878 | 1013 | 362 | 130-31 | 955-56 | 49 Râkshasa | 50 Anala | 3 Jyeshṭha | 9260 | 27.780 | 42 | 0.126 |
| 4058 | 879 | 1014 | 363 | 131-32 | *956-57 | 50 Anala | 51 Piṅgala | | | | | |
| 4059 | 880 | 1015 | 364 | 132-33 | 957-58 | 51 Piṅgala | 52 Kâlayukta | | | | | |
| 4060 | 881 | 1016 | 365 | 133-34 | 958-59 | 52 Kâlayukta | 53 Siddhârthin | 2 Vaiśâkha | 9894 | 29.682 | 298 | 0.894 |
| 4061 | 882 | 1017 | 366 | 134-35 | 959-60 | 53 Siddhârthin | 54 Raudra | | | | | |
| 4062 | 883 | 1018 | 367 | 135-36 | *960-61 | 54 Raudra | 55 Durmati | 6 Bhâdrapada | 9809 | 29.427 | 274 | 0.822 |
| 4063 | 884 | 1019 | 368 | 136-37 | 961-62 | 55 Durmati | 56 Dundubhi | | | | | |
| 4064 | 885 | 1020 | 369 | 137-38 | 962-63 | 56 Dundubhi | 57 Rudhirodgârin | | | | | |
| 4065 | 886 | 1021 | 370 | 138-39 | 963-64 | 57 Rudhirodgârin | 58 Raktâksha | 4 Âshâḍha | 9588 | 28.764 | 411 | 1.233 |
| 4066 | 887 | 1022 | 371 | 139-40 | *964-65 | 58 Raktâksha | 59 Krodhana | | | | | |
| 4067 | 888 | 1023 | 372 | 140-41 | 965-66 | 59 Krodhana | 60 Kshaya | | | | | |
| 4068 | 889 | 1024 | 373 | 141-42 | 966-67 | 60 Kshaya | 1 Prabhava | 3 Jyeshṭha | 9786 | 29.358 | 472 | 1.416 |
| 4069 | 890 | 1025 | 374 | 142-43 | 967-68 | 1 Prabhava | 2 Vibhava | | | | | |
| 4070 | 891 | 1026 | 375 | 143-44 | *968-69 | 2 Vibhava | 3 Śukla | 7 Âśvina | 9783 | 29.349 | 131 | 0.393 |
| 4071 | 892 | 1027 | 376 | 144-45 | 969-70 | 3 Śukla | 4 Pramoda | | | | | |
| 4072 | 893 | 1028 | 377 | 145-46 | 970-71 | 4 Pramoda | 5 Prajâpati | | | | | |
| 4073 | 894 | 1029 | 378 | 146-47 | 971-72 | 5 Prajâpati | 6 Aṅgiras | 5 Śrâvaṇa | 9916 | 29.748 | 537 | 1.611 |
| 4074 | 895 | 1030 | 379 | 147-48 | *972-73 | 6 Aṅgiras | 7 Śrîmukha | | | | | |
| 4075 | 896 | 1031 | 380 | 148-49 | 973-74 | 7 Śrîmukha | 8 Bhâva | | | | | |

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

| II. ADDED LUNAR MONTHS (continued.) Mean. Name of month. | Time of the preceding saṅkrânti expressed in Lunation parts (*l.*) | Time of the preceding saṅkrânti expressed in Tithis. | Time of the succeeding saṅkrânti expressed in Lunation parts (*l.*) | Time of the succeeding saṅkrânti expressed in Tithis. | III. COMMENCEMENT OF THE Solar year. Day and Month A. D. | (Time of the Mesha saṅkrânti.) Week day. | By the Ârya Siddhânta. Gh. Pa. | By the Ârya Siddhânta. H. M. | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. Moon's Age. Lunar parts elapsed (*t.*) | Moon's Age. Tithis elapsed. | *a.* | *b.* | *c.* | Kali. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8a | 9a | 10a | 11a | 12a | 13 | 14 | 15 | 17 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 8 Kârttika ..... | 9863 | 29.589 | 170 | 0.511 | 22 Mar (81) | 2 Mon | 26 21 | 10 32 | 1 Mar. (60) | 2 Mon | 30 | .090 | 9812 | 408 | 228 | 4043 |
| .................. | ..... | ........ | ..... | ........ | 22 Mar. (81) | 3 Tues. | 41 52 | 16 45 | 20 Mar. (79) | 1 Sun. | 104 | .312 | 9846 | 344 | 272 | 4044 |
| .................. | ..... | ........ | ..... | ........ | 22 Mar. (81) | 4 Wed | 57 24 | 22 57 | 9 Mar. (68) | 5 Thur. | ☉ —6 | —.018 | 9722 | 191 | 241 | 4045 |
| 4 Âshâḍha ..... | 9698 | 29.095 | 6 | 0.017 | 22 Mar (82) | 6 Fri. | 12 55 | 5 10 | 27 Feb (58) | 3 Tues. | 142 | .426 | 9956 | 74 | 213 | 4046 |
| .................. | ..... | ........ | ..... | ........ | 22 Mar (81) | 0 Sat | 28 26 | 11 22 | 17 Mar (76) | 2 Mon | 120 | .360 | 9971 | 10 | 264 | 4047 |
| .................. | ..... | ........ | ..... | ........ | 22 Mar (81) | 1 Sun. | 43 57 | 17 35 | 7 Mar. (66) | 0 Sat. | 238 | .714 | 185 | 894 | 236 | 4048 |
| 1 Chaitra ..... | 9841 | 29.523 | 148 | 0.445 | 22 Mar (81) | 2 Mon | 59 29 | 23 47 | 24 Feb (55) | 4 Wed | 63 | .189 | 61 | 741 | 206 | 4049 |
| .................. | ..... | ........ | ..... | ........ | 22 Mar (82) | 4 Wed. | 15 0 | 6 0 | 14 Mar (74) | 3 Tues | 110 | .330 | 96 | 677 | 257 | 4050 |
| 10 Pausha ..... | 9984 | 29.952 | 291 | 0.874 | 22 Mar. (81) | 5 Thur | 30 31 | 12 12 | 3 Mar (62) | 0 Sat | 90 | .270 | 9971 | 524 | 226 | 4051 |
| .................. | ..... | ........ | ..... | ........ | 22 Mar (81) | 6 Fri | 46 2 | 18 25 | 22 Mar. (81) | 6 Fri | 182 | .546 | 6 | 460 | 277 | 4052 |
| .................. | ..... | ........ | ..... | ........ | 23 Mar (82) | 1 Sun. | 1 34 | 0 37 | 11 Mar (70) | 3 Tues | 153 | .459 | 9882 | 307 | 247 | 4053 |
| 6 Bhâdrapada .. | 9819 | 29.458 | 127 | 0.380 | 22 Mar. (82) | 2 Mon. | 17 5 | 6 50 | 28 Feb (59) | 0 Sat | 14 | .042 | 9758 | 155 | 216 | 4054 |
| .................. | ..... | ........ | ..... | ........ | 22 Mar (81) | 3 Tues. | 32 36 | 13 2 | 18 Mar. (77) | 6 Fri | 7 | .021 | 9792 | 91 | 267 | 4055 |
| .................. | ..... | ........ | ..... | ........ | 22 Mar. (81) | 4 Wed. | 48 7 | 19 15 | 8 Mar. (67) | 4 Wed. | 125 | .375 | 7 | 974 | 239 | 4056 |
| 3 Jyeshṭha ..... | 9962 | 29.886 | 269 | 0.808 | 23 Mar. (82) | 6 Fri. | 3 39 | 1 27 | 26 Feb (57) | 2 Mon. | 254 | .762 | 221 | 858 | 211 | 4057 |
| .................. | ..... | ........ | ..... | ........ | 22 Mar (82) | 0 Sat. | 19 10 | 7 40 | 16 Mar. (76) | 1 Sun | 260 | .780 | 255 | 794 | 262 | 4058 |
| 11 Mâgha ..... | 9797 | 29.392 | 105 | 0.314 | 22 Mar (81) | 1 Sun | 34 41 | 13 52 | 5 Mar (64) | 5 Thur | 163 | .489 | 131 | 641 | 231 | 4059 |
| .................. | ..... | ........ | ..... | ........ | 22 Mar (81) | 2 Mon. | 50 12 | 20 5 | 22 Feb. (53) | 2 Mon | 161 | .483 | 7 | 488 | 200 | 4060 |
| .................. | ..... | ........ | ..... | ........ | 23 Mar (82) | 4 Wed. | 5 44 | 2 17 | 13 Mar (72) | 1 Sun | 247 | .741 | 42 | 424 | 252 | 4061 |
| 8 Kârttika ..... | 9940 | 29.821 | 248 | 0.743 | 22 Mar. (82) | 5 Thur | 21 15 | 8 30 | 1 Mar (61) | 5 Thur. | 197 | .591 | 9917 | 271 | 221 | 4062 |
| .................. | ..... | ........ | ..... | ........ | 22 Mar. (81) | 6 Fri. | 36 46 | 14 42 | 20 Mar. (79) | 4 Wed | 227 | .681 | 9952 | 207 | 272 | 4063 |
| .................. | ..... | ........ | ..... | ........ | 22 Mar (81) | 0 Sat. | 52 17 | 20 55 | 9 Mar. (68) | 1 Sun | 16 | .048 | 9828 | 54 | 242 | 4064 |
| 4 Âshâḍha ..... | 9776 | 29.327 | 83 | 0.249 | 23 Mar. (82) | 2 Mon | 7 49 | 3 7 | 27 Feb. (58) | 6 Fri. | 130 | .390 | 42 | 938 | 213 | 4065 |
| .................. | ..... | ........ | ..... | ........ | 22 Mar. (82) | 3 Tues. | 23 20 | 9 20 | 17 Mar. (77) | 5 Thur | 117 | .351 | 77 | 874 | 265 | 4066 |
| .................. | ..... | ........ | ..... | ........ | 22 Mar. (81) | 4 Wed | 38 51 | 15 32 | 7 Mar. (66) | 3 Tues. | 291 | .873 | 291 | 757 | 237 | 4067 |
| 1 Chaitra ..... | 9918 | 29.755 | 226 | 0.677 | 22 Mar. (81) | 5 Thur | 54 22 | 21 45 | 24 Feb. (55) | 0 Sat. | 223 | .669 | 167 | 603 | 206 | 4068 |
| .................. | ..... | ........ | ..... | ........ | 23 Mar. (82) | 0 Sat. | 9 54 | 3 57 | 15 Mar (74) | 6 Fri. | 305 | .915 | 201 | 541 | 257 | 4069 |
| 9 Mârgaśîrsha | 9754 | 29.261 | 61 | 0.183 | 22 Mar (82) | 1 Sun | 25 25 | 10 10 | 3 Mar (63) | 3 Tues | 308 | .924 | 77 | 388 | 228 | 4070 |
| .................. | ..... | ........ | ..... | ........ | 22 Mar. (81) | 2 Mon | 40 56 | 16 22 | 21 Mar. (80) | 1 Sun. | 49 | .147 | 9773 | 287 | 275 | 4071 |
| .................. | ..... | ........ | ..... | ........ | 22 Mar. (81) | 3 Tues. | 56 27 | 22 35 | 11 Mar (70) | 6 Fri. | 250 | .750 | 9987 | 171 | 247 | 4072 |
| 6 Bhâdrapada .. | 9897 | 29.690 | 204 | 0.612 | 23 Mar. (82) | 5 Thur | 11 59 | 4 47 | 28 Feb (59) | 3 Tues | 20 | .060 | 9863 | 18 | 216 | 4073 |
| .................. | ..... | ........ | ..... | ........ | 22 Mar. (82) | 6 Fri. | 27 30 | 11 0 | 18 Mar (78) | 2 Mon | ☉ —2 | —.006 | 9898 | 954 | 267 | 4074 |
| .................. | ..... | ........ | ..... | ........ | 22 Mar (81) | 0 Sat | 43 1 | 17 12 | 8 Mar (67) | 0 Sat | 133 | .399 | 112 | 838 | 239 | 4075 |

☉ See Text, Art. 101 above, para. 2.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR | | | | | | | | II. ADDED LUNAR MONTHS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Saṁvatsara. | | True. | | | | |
| | | | | | | | | | Time of the preceding saṅkrânti expressed in | | Time of the succeeding saṅkrânti expressed in | |
| Kali. | Saka. | Chaitrâdi. Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | Luni-Solar cycle (Southern.) | Brihaspati cycle (Northern) current at Mesha saṅkrânti | Name of month | Lunation parts (l.) | Tithis | Lunation parts (l.) | Tithis |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4076 | 897 | 1032 | 381 | 149-50 | 974-75 | 8 Bhâva | 9 Yuvan | 3 Jyeshṭha | 9257 | 27.861 | 5 | 0.015 |
| 4077 | 898 | 1033 | 382 | 150-51 | 975-76 | 9 Yuvan | 10 Dhâtri | | | | | |
| 4078 | 899 | 1034 | 383 | 151-52 | *976-77 | 10 Dhâtri | 11 Îśvara | | | | | |
| 4079 | 900 | 1035 | 384 | 152-53 | 977-78 | 11 Îśvara | 12 Bahudhânya | 1 Chaitra | 9862 | 29.586 | 91 | 0.273 |
| 4080 | 901 | 1036 | 385 | 153-54 | 978-79 | 12 Bahudhânya | 13 Pramâthin. | | | | | |
| 4081 | 902 | 1037 | 386 | 154-55 | 979-80 | 13 Pramâthin | 14 Vikrama | 5 Śrâvaṇa | 9411 | 28.233 | 4 | 0.012 |
| 4082 | 903 | 1038 | 387 | 155-56 | *980-81 | 14 Vikrama | 15 Vrisha. | | | | | |
| 4083 | 904 | 1039 | 388 | 156-57 | 981-82 | 15 Vrisha | 16 Chitrabhânu | | | | | |
| 4084 | 905 | 1040 | 389 | 157-58 | 982-83 | 16 Chitrabhânu | 17 Subhânu | 4 Âshâḍha | 9545 | 28.635 | 421 | 1.263 |
| 4085 | 906 | 1041 | 390 | 158-59 | 983-84 | 17 Subhânu | 18 Târaṇa. | | | | | |
| 4086 | 907 | 1042 | 391 | 159-60 | *984-85 | 18 Târaṇa. | 19 Pârthiva. | | | | | |
| 4087 | 908 | 1043 | 392 | 160-61 | 985-86 | 19 Pârthiva | 20 Vyaya | 3 Jyeshṭha | 9944 | 29.832 | 529 | 1.587 |
| 4088 | 909 | 1044 | 393 | 161-62 | 986-87 | 20 Vyaya | 21 Sarvajit | | | | | |
| 4089 | 910 | 1045 | 394 | 162-63 | 987-88 | 21 Sarvajit | 22 Sarvadhârin | 7 Âśvina | 9892 | 29.676 | 165 | 0.495 |
| 4090 | 911 | 1046 | 395 | 163-64 | *988-89 | 22 Sarvadhârin | 23 Virodhin | | | | | |
| 4091 | 912 | 1047 | 396 | 164-65 | 989-90 | 23 Virodhin | 24 Vikṛita | | | | | |
| 4092 | 913 | 1048 | 397 | 165-66 | 990-91 | 24 Vikṛita | 25 Khara | 5 Śrâvaṇa | 9960 | 29.880 | 679 | 2.037 |
| 4093 | 914 | 1049 | 398 | 166-67 | 991-92 | 25 Khara | 26 Nandana | | | | | |
| 4094 | 915 | 1050 | 399 | 167-68 | *992-93 | 26 Nandana | 27 Vijaya | | | | | |
| 4095 | 916 | 1051 | 400 | 168-69 | 993-94 | 27 Vijaya | 28 Jaya | 3 Jyeshṭha | 9414 | 28.242 | 30 | 0.090 |
| 4096 | 917 | 1052 | 401 | 169-70 | 994-95 | 28 Jaya | 29 Manmatha [1] | | | | | |
| 4097 | 918 | 1053 | 402 | 170-71 | 995-96 | 29 Manmatha | 31 Hemalamba | | | | | |
| 4098 | 919 | 1054 | 403 | 171-72 | *996-97 | 30 Durmukha | 32 Vilamba | 1 Chaitra | 9918 | 29.754 | 219 | 0.657 |
| 4099 | 920 | 1055 | 404 | 172-73 | 997-98 | 31 Hemalamba | 33 Vikârin | | | | | |
| 4100 | 921 | 1056 | 405 | 173-74 | 998-99 | 32 Vilamba | 34 Śârvari | 5 Śrâvaṇa | 9488 | 28.464 | 172 | 0.516 |
| 4101 | 922 | 1057 | 406 | 174-75 | 999-1000 | 33 Vikârin | 35 Plava | | | | | |
| 4102 | 923 | 1058 | 407 | 175-76 | *1000-1 | 34 Śârvari | 36 Śubhakrit | | | | | |
| 4103 | 924 | 1059 | 408 | 176-77 | 1001-2 | 35 Plava | 37 Śobhana. | 4 Âshâḍha | 9545 | 28.635 | 379 | 1.137 |
| 4104 | 925 | 1060 | 409 | 177-78 | 1002-3 | 36 Śubhakrit | 38 Krodhin | | | | | |
| 4105 | 926 | 1061 | 410 | 178-79 | 1003-4 | 37 Śobhana | 39 Viśvâvasu | | | | | |
| 4106 | 927 | 1062 | 411 | 179-80 | *1004-5 | 38 Krodhin | 40 Parâbhava | 2 Vaiśâkha | 9717 | 29.151 | 139 | 0.417 |
| 4107 | 928 | 1063 | 412 | 180-81 | 1005-6 | 39 Viśvâvasu | 41 Plavaṅga | | | | | |

1) Durmukha, No. 30, was suppressed in the north.

# TABLE I.

(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.

| II. ADDED LUNAR MONTHS (continued.) | | | | | III. COMMENCEMENT OF THE | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean. | | | | | Solar year | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | Kali. |
| Name of month | Time of the preceding saṅkrânti expressed in | | Time of the succeeding saṅkrânti expressed in | | Day and Month A. D. | (Time of the Mesha saṅkrânti.) | | | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. | | | | | |
| | | | | | | Week day. | By the Ârya Siddhânta. | | | | Moon's Age | | a. | b. | c. | |
| | Lunation parts (l.) | Tithis. | Lunation parts (l.) | Tithis. | | | Gh. Pa. | H. M. | | | Lunar parts elapsed. (l.) | Tithis elapsed. | | | | |
| 8a | 9a | 10a | 11a | 12a | 13 | 14 | 15 | 17 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 2 Vaiśâkha.... | 9732 | 29.196 | 39 | 0.118 | 22 Mar. (81) | 1 Sun | 58 32 | 23 25 | 25 Feb. (56) | 4 Wed. | 2 | .006 | 9988 | 685 | 208 | 4076 |
| | | | | | 23 Mar. (82) | 3 Tues. | 14 4 | 5 37 | 16 Mar. (75) | 3 Tues. | 65 | .195 | 22 | 621 | 260 | 4077 |
| 11 Mâgha..... | 9875 | 29.624 | 182 | 0.546 | 22 Mar. (82) | 4 Wed. | 29 36 | 11 50 | 4 Mar. (64) | 0 Sat. | 66 | .198 | 9898 | 468 | 229 | 4078 |
| | | | | | 22 Mar. (81) | 5 Thur. | 45 6 | 18 2 | 21 Feb. (52) | 4 Wed. | 46 | .138 | 9774 | 315 | 198 | 4079 |
| | | | | | 23 Mar. (82) | 0 Sat. | 0 37 | 0 15 | 12 Mar. (71) | 3 Tues. | 88 | .264 | 9808 | 251 | 249 | 4080 |
| 7 Âśvina...... | 9710 | 29.130 | 17 | 0.052 | 23 Mar. (82) | 1 Sun | 16 9 | 6 27 | 2 Mar. (61) | 1 Sun. | 269 | .807 | 23 | 135 | 221 | 4081 |
| | | | | | 22 Mar. (82) | 2 Mon. | 31 40 | 12 40 | 20 Mar. (80) | 0 Sat. | 258 | .774 | 57 | 71 | 273 | 4082 |
| | | | | | 22 Mar. (81) | 3 Tues. | 47 11 | 18 52 | 9 Mar. (68) | 4 Wed. | 4 | .016 | 9933 | 916 | 242 | 4083 |
| 4 Âshâḍha .... | 9853 | 29.559 | 160 | 0.481 | 23 Mar. (82) | 5 Thur. | 2 42 | 1 5 | 27 Feb. (58) | 2 Mon. | 157 | .471 | 148 | 801 | 214 | 4084 |
| | | | | | 23 Mar. (82) | 6 Fri. | 18 14 | 7 17 | 18 Mar. (77) | 1 Sun. | 182 | .546 | 162 | 737 | 265 | 4085 |
| | | | | | 22 Mar. (82) | 0 Sat. | 33 45 | 13 30 | 6 Mar. (66) | 5 Thur. | 127 | .381 | 58 | 585 | 234 | 4086 |
| 1 Chaitra..... | 9996 | 29.987 | 303 | 0.909 | 22 Mar. (81) | 1 Sun. | 49 16 | 19 42 | 23 Feb. (54) | 2 Mon. | 136 | .408 | 9934 | 432 | 203 | 4087 |
| | | | | | 23 Mar. (82) | 3 Tues. | 4 47 | 1 55 | 14 Mar. (73) | 1 Sun. | 211 | .633 | 9968 | 368 | 255 | 4088 |
| 9 Mârgaśîrsha . | 9831 | 29.493 | 138 | 0.415 | 23 Mar. (82) | 4 Wed. | 20 19 | 8 7 | 4 Mar. (63) | 6 Fri. | 277 | .831 | 183 | 251 | 226 | 4089 |
| | | | | | 22 Mar. (82) | 5 Thur. | 35 50 | 14 20 | 21 Mar. (81) | 4 Wed. | 132 | .396 | 9879 | 151 | 275 | 4090 |
| | | | | | 22 Mar. (81) | 6 Fri. | 51 21 | 20 32 | 11 Mar. (70) | 2 Mon. | 263 | .789 | 99 | 34 | 247 | 4091 |
| 6 Bhâdrapada .. | 9974 | 29.921 | 281 | 0.844 | 23 Mar. (82) | 1 Sun. | 6 52 | 2 45 | 28 Feb. (59) | 6 Fri. | 15 | .045 | 9969 | 882 | 216 | 4092 |
| | | | | | 23 Mar. (82) | 2 Mon. | 22 24 | 8 57 | 19 Mar. (78) | 5 Thur. | 16 | .048 | 3 | 818 | 267 | 4093 |
| | | | | | 22 Mar. (82) | 3 Tues. | 37 55 | 15 10 | 8 Mar. (68) | 3 Tues. | 224 | .672 | 216 | 701 | 230 | 4094 |
| 2 Vaiśâkha.... | 9809 | 29.428 | 117 | 0.350 | 22 Mar. (81) | 4 Wed. | 53 26 | 21 22 | 25 Feb. (56) | 0 Sat. | 193 | .579 | 93 | 548 | 209 | 4095 |
| | | | | | 23 Mar. (82) | 6 Fri. | 8 57 | 3 35 | 16 Mar. (75) | 6 Fri. | 282 | .846 | 128 | 484 | 260 | 4096 |
| 11 Mâgha...... | 9952 | 29.856 | 259 | 0.778 | 23 Mar. (82) | 0 Sat. | 24 29 | 9 47 | 5 Mar. (64) | 3 Tues. | 268 | .804 | 4 | 332 | 229 | 4097 |
| | | | | | 22 Mar. (82) | 1 Sun. | 40 0 | 16 0 | 22 Feb. (53) | 0 Sat. | 149 | .447 | 9879 | 179 | 198 | 4098 |
| | | | | | 22 Mar. (81) | 2 Mon. | 55 31 | 22 12 | 12 Mar. (71) | 6 Fri. | 147 | .441 | 9914 | 115 | 250 | 4099 |
| 7 Âśvina ..... | 9787 | 29.362 | 95 | 0.284 | 23 Mar. (82) | 4 Wed. | 11 2 | 4 25 | 2 Mar. (61) | 4 Wed. | 267 | .801 | 126 | 998 | 221 | 4100 |
| | | | | | 23 Mar. (82) | 5 Thur. | 26 34 | 10 37 | 21 Mar. (80) | 3 Tues. | 246 | .738 | 163 | 934 | 273 | 4101 |
| | | | | | 22 Mar. (82) | 6 Fri. | 42 5 | 16 50 | 9 Mar. (69) | 0 Sat. | 42 | .126 | 39 | 782 | 242 | 4102 |
| 4 Âshâḍha .... | 9930 | 29.790 | 238 | 0.713 | 22 Mar. (81) | 0 Sat. | 57 36 | 23 2 | 27 Feb. (58) | 5 Thur. | 275 | .825 | 253 | 665 | 214 | 4103 |
| | | | | | 23 Mar. (82) | 2 Mon. | 13 7 | 5 15 | 17 Mar. (76) | 3 Tues. | 33 | .099 | 9940 | 505 | 262 | 4104 |
| 12 Phâlguna.... | 9766 | 29.297 | 73 | 0.219 | 23 Mar. (82) | 3 Tues. | 28 39 | 11 27 | 6 Mar. (65) | 0 Sat. | 39 | .117 | 9825 | 412 | 231 | 4105 |
| | | | | | 22 Mar. (82) | 4 Wed. | 44 10 | 17 40 | 24 Feb. (55) | 5 Thur. | 316 | .948 | 39 | 295 | 203 | 4106 |
| | | | | | 22 Mar. (81) | 5 Thur. | 59 41 | 23 52 | 13 Mar. (72) | 3 Tues. | 6 | .018 | 9735 | 195 | 252 | 4107 |

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| Kali. | Śaka. | Chaitrâdi Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | Luni-Solar cycle. (Southern.) | Brihaspati cycle (Northern) current at Mesha saṅkrânti | Name of month. | Time of the preceding saṅkrânti expressed in | | Time of the succeeding saṅkrânti expressed in | |
| | | | | | | | | | Lunation parts. (*l.*) | Tithis. | Lunation parts. (*l.*) | Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4108 | 929 | 1064 | 413 | 181- 82 | 1006- 7 | 40 Parâbhava | 42 Kîlaka | 6 Bhâdrapada | 9657 | 28.971 | 80 | 0.240 |
| 4109 | 930 | 1065 | 414 | 182- 83 | 1007- 8 | 41 Plavaṅga | 43 Saumya | | | | | |
| 4110 | 931 | 1066 | 415 | 183- 84 | *1008- 9 | 42 Kîlaka | 44 Sâdhâraṇa | | | | | |
| 4111 | 932 | 1067 | 416 | 184- 85 | 1009-10 | 43 Saumya | 45 Virodhakṛit | 5 Śrâvaṇa | 9924 | 29.772 | 725 | 2.175 |
| 4112 | 933 | 1068 | 417 | 185- 86 | 1010-11 | 44 Sâdhâraṇa | 46 Paridhâvin | | | | | |
| 4113 | 934 | 1069 | 418 | 186- 87 | 1011-12 | 45 Virodhakṛit | 47 Pramâdin | | | | | |
| 4114 | 935 | 1070 | 419 | 187- 88 | *1012-13 | 46 Paridhâvin | 48 Ânanda | 3 Jyeshṭha | 9606 | 28.818 | 155 | 0.465 |
| 4115 | 936 | 1071 | 420 | 188- 89 | 1013-14 | 47 Pramâdin | 49 Râkshasa | | | | | |
| 4116 | 937 | 1072 | 421 | 189- 90 | 1014-15 | 48 Ânanda | 50 Anala | | | | | |
| 4117 | 938 | 1073 | 422 | 190- 91 | 1015-16 | 49 Râkshasa | 51 Piṅgala | 1 Chaitra | 9896 | 29.688 | 251 | 0.753 |
| 4118 | 939 | 1074 | 423 | 191- 92 | *1016-17 | 50 Anala | 52 Kâlayukta | | | | | |
| 4119 | 940 | 1075 | 424 | 192- 93 | 1017-18 | 51 Piṅgala | 53 Siddhârthin | 5 Śrâvaṇa | 9474 | 28.422 | 253 | 0.759 |
| 4120 | 941 | 1076 | 425 | 193- 94 | 1018-19 | 52 Kâlayukta | 54 Raudra | | | | | |
| 4121 | 942 | 1077 | 426 | 194- 95 | 1019-20 | 53 Siddhârthin | 55 Durmati | | | | | |
| 4122 | 943 | 1078 | 427 | 195- 96 | *1020-21 | 54 Raudra | 56 Dundubhi | 4 Âshâḍha | 9635 | 28.905 | 373 | 1.119 |
| 4123 | 944 | 1079 | 428 | 196- 97 | 1021-22 | 55 Durmati | 57 Rudhirodgârin | | | | | |
| 4124 | 945 | 1080 | 429 | 197- 98 | 1022-23 | 56 Dundubhi | 58 Raktâksha | | | | | |
| 4125 | 946 | 1081 | 430 | 198- 99 | 1023-24 | 57 Rudhirodgârin | 59 Krodhana | 2 Vaiśâkha | 9783 | 29.349 | 288 | 0.864 |
| 4126 | 947 | 1082 | 431 | 199-200 | *1024-25 | 58 Raktâksha | 60 Kshaya | | | | | |
| 4127 | 948 | 1083 | 432 | 200- 1 | 1025-26 | 59 Krodhana | 1 Prabhava | 6 Bhâdrapada | 9770 | 29.310 | 263 | 0.789 |
| 4128 | 949 | 1084 | 433 | 201- 2 | 1026-27 | 60 Kshaya | 2 Vibhava | | | | | |
| 4129 | 950 | 1085 | 434 | 202- 3 | 1027-28 | 1 Prabhava | 3 Śukla | | | | | |
| 4130 | 951 | 1086 | 435 | 203- 4 | *1028-29 | 2 Vibhava | 4 Pramoda | 5 Śrâvaṇa | 9898 | 29.694 | 693 | 2.079 |
| 4131 | 952 | 1087 | 436 | 204- 5 | 1029-30 | 3 Śukla | 5 Prajâpati | | | | | |
| 4132 | 953 | 1088 | 437 | 205- 6 | 1030-31 | 4 Pramoda | 6 Aṅgiras | | | | | |
| 4133 | 954 | 1089 | 438 | 206- 7 | 1031-32 | 5 Prajâpati | 7 Śrîmukha | 3 Jyeshṭha | 9781 | 29.343 | 347 | 1.041 |
| 4134 | 955 | 1090 | 439 | 207- 8 | *1032-33 | 6 Aṅgiras | 8 Bhâva | | | | | |
| 4135 | 956 | 1091 | 440 | 208- 9 | 1033-34 | 7 Śrîmukha | 9 Yuvan | | | | | |
| 4136 | 957 | 1092 | 441 | 209- 10 | 1034-35 | 8 Bhâva | 10 Dhâtṛi | 1 Chaitra | 9859 | 29.577 | 215 | 0.645 |
| 4137 | 958 | 1093 | 442 | 210- 11 | 1035-36 | 9 Yuvan | 11 Îśvara | | | | | |
| 4138 | 959 | 1094 | 443 | 211- 12 | *1036-37 | 10 Dhâtṛi | 12 Bahudhânya | 5 Śrâvaṇa | 9438 | 28.314 | 241 | 0.723 |
| 4139 | 960 | 1095 | 444 | 212- 13 | 1037-38 | 11 Îśvara | 13 Pramâthin | | | | | |

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

| II. ADDED LUNAR MONTHS (continued.) | | | | | III. COMMENCEMENT OF THE | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean. | | | | | Solar year. | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | Kali. |
| Name of month | Time of the preceding saṅkrânti expressed in: Lunation parts. (t.) | Time of the preceding saṅkrânti expressed in: Tithis. | Time of the succeeding saṅkrânti expressed in: Lunation parts. (t.) | Time of the succeeding saṅkrânti expressed in: Tithis. | Day and Month A. D. | (Time of the Mesha saṅkrânti.) Week day. | By the Ârya Siddhânta. Gh. | Pa. | H. | M. | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. Moon's Age. Lunar parts elapsed. (t.) | Tithis elapsed. | a. | b. | c. | |
| 8a | 9a | 10a | 11a | 12a | 13 | 14 | 15 | | 17 | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 9 Mârgaśîrsha | 9906 | 29.725 | 216 | 0.647 | 23 Mar. (82) | 0 Sat. | 15 | 12 | 6 | 5 | 3 Mar. (62) | 1 Sun. | 158 | .474 | 9950 | 79 | 224 | 4108 |
| | | | | | 23 Mar. (82) | 1 Sun. | 30 | 44 | 12 | 17 | 22 Mar. (81) | 0 Sat. | 137 | .411 | 9984 | 14 | 275 | 4109 |
| | | | | | 22 Mar. (82) | 2 Mon. | 46 | 15 | 18 | 30 | 11 Mar. (71) | 5 Thur. | 255 | .765 | 199 | 898 | 247 | 4110 |
| 5 Śrâvaṇa | 9744 | 29.231 | 51 | 0.153 | 23 Mar. (82) | 4 Wed. | 1 | 46 | 0 | 42 | 28 Feb. (59) | 2 Mon. | 76 | .227 | 74 | 745 | 216 | 4111 |
| | | | | | 23 Mar. (82) | 5 Thur. | 17 | 17 | 6 | 55 | 19 Mar. (78) | 1 Sun. | 122 | .366 | 109 | 681 | 268 | 4112 |
| | | | | | 23 Mar. (82) | 6 Fri. | 32 | 49 | 13 | 7 | 8 Mar. (67) | 5 Thur. | 101 | .303 | 9985 | 528 | 237 | 4113 |
| 2 Vaiśâkha | 9886 | 29.659 | 194 | 0.582 | 22 Mar. (82) | 0 Sat. | 48 | 20 | 19 | 20 | 25 Feb. (56) | 2 Mon. | 100 | .300 | 9860 | 374 | 206 | 4114 |
| | | | | | 23 Mar. (82) | 2 Mon. | 3 | 51 | 1 | 32 | 15 Mar. (74) | 1 Sun. | 165 | .495 | 9895 | 312 | 257 | 4115 |
| 10 Pausha | 9722 | 29.166 | 29 | 0.088 | 23 Mar. (82) | 3 Tues. | 19 | 22 | 7 | 45 | 4 Mar. (63) | 5 Thur. | 28 | .084 | 9771 | 159 | 226 | 4116 |
| | | | | | 23 Mar. (82) | 4 Wed. | 34 | 54 | 13 | 57 | 22 Feb. (53) | 3 Tues. | 165 | .495 | 9985 | 42 | 198 | 4117 |
| | | | | | 22 Mar. (82) | 5 Thur. | 50 | 25 | 20 | 10 | 12 Mar. (72) | 2 Mon. | 140 | .420 | 20 | 978 | 250 | 4118 |
| 7 Âśvina | 9865 | 29.594 | 172 | 0.516 | 23 Mar. (82) | 0 Sat. | 5 | 56 | 2 | 22 | 2 Mar. (61) | 0 Sat. | 268 | .804 | 234 | 862 | 221 | 4119 |
| | | | | | 23 Mar. (82) | 1 Sun. | 21 | 27 | 8 | 35 | 21 Mar. (80) | 6 Fri. | 275 | .825 | 269 | 798 | 273 | 4120 |
| | | | | | 23 Mar. (82) | 2 Mon. | 36 | 59 | 14 | 47 | 10 Mar. (69) | 3 Tues. | 174 | .522 | 144 | 645 | 242 | 4121 |
| 3 Jyeshṭha | 9700 | 29.100 | 7 | 0.022 | 22 Mar. (82) | 3 Tues. | 52 | 30 | 21 | 0 | 27 Feb. (58) | 0 Sat. | 168 | .504 | 20 | 492 | 211 | 4122 |
| | | | | | 23 Mar. (82) | 5 Thur. | 8 | 1 | 3 | 12 | 17 Mar. (76) | 6 Fri. | 257 | .771 | 55 | 428 | 262 | 4123 |
| 12 Phâlguna | 9843 | 29.529 | 150 | 0.451 | 23 Mar. (82) | 6 Fri. | 23 | 32 | 9 | 25 | 6 Mar. (65) | 3 Tues. | 208 | .624 | 9930 | 276 | 232 | 4124 |
| | | | | | 23 Mar. (82) | 0 Sat. | 39 | 4 | 15 | 37 | 23 Feb. (54) | 0 Sat. | 47 | .141 | 9806 | 123 | 201 | 4125 |
| | | | | | 22 Mar. (82) | 1 Sun. | 54 | 35 | 21 | 50 | 13 Mar. (73) | 6 Fri. | 32 | .096 | 9841 | 59 | 252 | 4126 |
| 9 Mârgaśîrsha | 9986 | 29.957 | 293 | 0.879 | 23 Mar. (82) | 3 Tues. | 10 | 6 | 4 | 2 | 3 Mar. (62) | 4 Wed. | 146 | .438 | 55 | 942 | 224 | 4127 |
| | | | | | 23 Mar. (82) | 4 Wed. | 25 | 37 | 10 | 15 | 22 Mar. (81) | 3 Tues. | 133 | .399 | 90 | 878 | 275 | 4128 |
| | | | | | 23 Mar. (82) | 5 Thur. | 41 | 9 | 16 | 27 | 12 Mar. (71) | 1 Sun. | 304 | .912 | 304 | 762 | 247 | 4129 |
| 5 Śrâvaṇa | 9821 | 29.463 | 128 | 0.385 | 22 Mar. (82) | 6 Fri. | 56 | 40 | 22 | 40 | 29 Feb. (60) | 5 Thur. | 232 | .696 | 180 | 609 | 217 | 4130 |
| | | | | | 23 Mar. (82) | 1 Sun. | 12 | 11 | 4 | 52 | 19 Mar. (78) | 4 Wed. | 316 | .948 | 215 | 545 | 268 | 4131 |
| | | | | | 23 Mar. (82) | 2 Mon. | 27 | 42 | 11 | 5 | 8 Mar. (67) | 1 Sun. | 319 | .957 | 90 | 392 | 237 | 4132 |
| 2 Vaiśâkha | 9964 | 29.891 | 271 | 0.813 | 23 Mar. (82) | 3 Tues. | 43 | 14 | 17 | 17 | 25 Feb. (56) | 5 Thur. | 248 | .744 | 9966 | 239 | 206 | 4133 |
| | | | | | 22 Mar. (82) | 4 Wed. | 58 | 45 | 23 | 30 | 15 Mar. (75) | 4 Wed. | 266 | .798 | 1 | 175 | 258 | 4134 |
| 10 Pausha | 9799 | 29.398 | 107 | 0.320 | 23 Mar. (82) | 6 Fri. | 14 | 16 | 5 | 42 | 4 Mar. (63) | 1 Sun. | 36 | .108 | 9876 | 22 | 227 | 4135 |
| | | | | | 23 Mar. (82) | 0 Sat. | 29 | 47 | 11 | 55 | 22 Feb. (53) | 6 Fri. | 156 | .468 | 91 | 906 | 199 | 4136 |
| | | | | | 23 Mar. (82) | 1 Sun. | 45 | 19 | 18 | 7 | 13 Mar. (72) | 5 Thur. | 148 | .444 | 125 | 842 | 250 | 4137 |
| 7 Âśvina | 9942 | 29.826 | 240 | 0.719 | 23 Mar. (83) | 3 Tues. | 0 | 50 | 0 | 20 | 1 Mar. (61) | 2 Mon. | 12 | .036 | 1 | 689 | 219 | 4138 |
| | | | | | 23 Mar. (82) | 4 Wed. | 16 | 21 | 6 | 32 | 20 Mar. (79) | 1 Sun. | 77 | .231 | 36 | 625 | 270 | 4139 |

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| Kali. | Saka. | Chaitrâdi Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | Luni-Solar cycle. (Southern.) | Bṛihaspati cycle (Northern) current at Mesha saṅkrânti. | Name of month. | Time of the preceding saṅkrânti expressed in: Lunation parts (t.) | Time of the preceding saṅkrânti expressed in: Tithis. | Time of the succeeding saṅkrânti expressed in: Lunation parts (t.) | Time of the succeeding saṅkrânti expressed in: Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4140 | 961 | 1096 | 445 | 213-14 | 1038-39 | 12 Bahudhânya | 14 Vikrama | | | | | |
| 4141 | 962 | 1097 | 446 | 214-15 | 1039-40 | 13 Pramâthin | 15 Vṛisha | 4 Âshâḍha | 9811 | 29.433 | 606 | 1.818 |
| 4142 | 963 | 1098 | 447 | 215-16 | *1040-41 | 14 Vikrama | 16 Chitrabhânu | | | | | |
| 4143 | 964 | 1099 | 448 | 216-17 | 1041-42 | 15 Vṛisha | 17 Subhânu | | | | | |
| 4144 | 965 | 1100 | 449 | 217-18 | 1042-43 | 16 Chitrabhânu | 18 Târaṇa | 2 Vaiśâkha | 9763 | 29.289 | 343 | 1.029 |
| 4145 | 966 | 1101 | 450 | 218-19 | 1043-44 | 17 Subhânu | 19 Pârthiva | | | | | |
| 4146 | 967 | 1102 | 451 | 219-20 | *1044-45 | 18 Târaṇa | 20 Vyaya | 6 Bhâdrapada | 9785 | 29.355 | 465 | 1.395 |
| 4147 | 968 | 1103 | 452 | 220-21 | 1045-46 | 19 Pârthiva | 21 Sarvajit | | | | | |
| 4148 | 969 | 1104 | 453 | 221-22 | 1046-47 | 20 Vyaya | 22 Sarvadhârin | | | | | |
| 4149 | 970 | 1105 | 454 | 222-23 | 1047-48 | 21 Sarvajit | 23 Virodhin | 5 Śrâvaṇa | 9288 | 27.864 | 666 | 1.998 |
| 4150 | 971 | 1106 | 455 | 223-24 | *1048-49 | 22 Sarvadhârin | 24 Vikṛita | | | | | |
| 4151 | 972 | 1107 | 456 | 224-25 | 1049-50 | 23 Virodhin | 25 Khara | | | | | |
| 4152 | 973 | 1108 | 457 | 225-26 | 1050-51 | 24 Vikṛita | 26 Nandana | 3 Jyeshṭha | 9867 | 29.601 | 522 | 1.566 |
| 4153 | 974 | 1109 | 458 | 226-27 | 1051-52 | 25 Khara | 27 Vijaya | | | | | |
| 4154 | 975 | 1110 | 459 | 227-28 | *1052-53 | 26 Nandana | 28 Jaya | 7 Âśvina<br>10 *Pausha* (*Ksh.*) | 9874<br>93 | 29.622<br>0.279 | 147<br>9938 | 0.441<br>29.814 |
| 4155 | 976 | 1111 | 460 | 228-29 | 1053-54 | 27 Vijaya | 29 Manmatha | 1 Chaitra | 9896 | 29.688 | 193 | 0.579 |
| 4156 | 977 | 1112 | 461 | 229-30 | 1054-55 | 28 Jaya | 30 Durmukha | | | | | |
| 4157 | 978 | 1113 | 462 | 230-31 | 1055-56 | 29 Manmatha | 31 Hemalamba | 5 Śrâvaṇa | 9452 | 28.356 | 200 | 0.600 |
| 4158 | 979 | 1114 | 463 | 231-32 | *1056-57 | 30 Durmukha | 32 Vilamba | | | | | |
| 4159 | 980 | 1115 | 464 | 232-33 | 1057-58 | 31 Hemalamba | 33 Vikârin | | | | | |
| 4160 | 981 | 1116 | 465 | 233-34 | 1058-59 | 32 Vilamba | 34 Śârvari | 3 Jyeshṭha | 9382 | 28.146 | 5 | 0.015 |
| 4161 | 982 | 1117 | 466 | 234-35 | 1059-60 | 33 Vikârin | 35 Plava | | | | | |
| 4162 | 983 | 1118 | 467 | 235-36 | *1060-61 | 34 Śârvari | 36 Śubhakṛit | | | | | |
| 4163 | 984 | 1119 | 468 | 236-37 | 1061-62 | 35 Plava | 37 Śobhana | 2 Vaiśâkha | 9726 | 29.178 | 316 | 0.948 |
| 4164 | 985 | 1120 | 469 | 237-38 | 1062-63 | 36 Śubhakṛit | 38 Krodhin | | | | | |
| 4165 | 986 | 1121 | 470 | 238-39 | 1063-64 | 37 Śobhana | 39 Viśvâvasu | 6 Bhâdrapada | 9743 | 29.229 | 370 | 1.110 |
| 4166 | 987 | 1122 | 471 | 239-40 | *1064-65 | 38 Krodhin | 40 Parâbhava | | | | | |
| 4167 | 988 | 1123 | 472 | 240-41 | 1065-66 | 39 Viśvâvasu | 41 Plavanga | | | | | |
| 4168 | 989 | 1124 | 473 | 241-42 | 1066-67 | 40 Parâbhava | 42 Kîlaka | 4 Âshâḍha | 9475 | 28.425 | 97 | 0.291 |
| 4169 | 990 | 1125 | 474 | 242-43 | 1067-68 | 41 Plavanga | 43 Saumya | | | | | |
| 4170 | 991 | 1126 | 475 | 243-44 | *1068-69 | 42 Kîlaka | 44 Sâdhâraṇa | | | | | |

# TABLE I.

(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.

| II. ADDED LUNAR MONTHS (continued.) | | | | | III. COMMENCEMENT OF THE | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean. | | | | | Solar year | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | Kali. |
| Name of month | Time of the preceding saṅkrânti expressed in | | Time of the succeeding saṅkrânti expressed in | | Day and Month A. D. | (Time of the Mesha saṅkrânti.) | | | | | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. | | | | | |
| | | | | | | Week day. | By the Ârya Siddhânta. | | | | | | Moon's Age. | | a. | b. | c. | |
| | Lunation parts. (t.) | Tithis. | Lunation parts. (t.) | Tithis. | | | Gh. | Pa. | H. | M. | | | Lunat. parts elapsed. (t.) | Tithis elapsed. | | | | |
| 8a | 9a | 10a | 11a | 12a | 13 | 14 | 15 | | 17 | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| | | | | | 23 Mar. (82) | 5 Thur. | 31 | 52 | 12 | 45 | 9 Mar. (68) | 5 Thur. | 74 | .222 | 9911 | 474 | 240 | 4140 |
| 3 Jyeshṭha.... | 9777 | 29.332 | 85 | 0.254 | 23 Mar. (82) | 6 Fri. | 47 | 24 | 18 | 57 | 26 Feb. (57) | 2 Mon. | 56 | .168 | 9787 | 320 | 209 | 4141 |
| | | | | | 23 Mar. (83) | 1 Sun. | 2 | 55 | 1 | 10 | 16 Mar. (76) | 1 Sun. | 102 | .306 | 9822 | 256 | 260 | 4142 |
| 12 Phâlguna... | 9920 | 29.760 | 227 | 0.682 | 23 Mar. (82) | 2 Mon. | 18 | 26 | 7 | 22 | 6 Mar. (65) | 6 Fri. | 283 | .849 | 36 | 139 | 232 | 4143 |
| | | | | | 23 Mar. (82) | 3 Tues. | 33 | 57 | 13 | 35 | 23 Feb. (54) | 3 Tues. | 42 | .126 | 9912 | 986 | 201 | 4144 |
| | | | | | 23 Mar. (82) | 4 Wed. | 49 | 29 | 19 | 47 | 14 Mar. (73) | 2 Mon. | 20 | .060 | 9946 | 922 | 252 | 4145 |
| 8 Kârttika.... | 9756 | 29.267 | 63 | 0.189 | 23 Mar. (83) | 6 Fri. | 5 | 0 | 2 | 0 | 3 Mar. (63) | 0 Sat. | 171 | .513 | 161 | 806 | 224 | 4146 |
| | | | | | 23 Mar. (82) | 0 Sat. | 20 | 31 | 8 | 12 | 22 Mar. (81) | 6 Fri. | 195 | .585 | 195 | 742 | 276 | 4147 |
| | | | | | 23 Mar. (82) | 1 Sun. | 36 | 2 | 14 | 25 | 11 Mar. (70) | 3 Tues. | 137 | .411 | 71 | 589 | 245 | 4148 |
| 5 Śrâvaṇa..... | 9898 | 29.695 | 206 | 0.617 | 23 Mar. (82) | 2 Mon. | 51 | 34 | 20 | 37 | 28 Feb. (59) | 0 Sat. | 144 | .432 | 9947 | [illegible] | 214 | 4149 |
| | | | | | 23 Mar. (83) | 4 Wed. | 7 | 5 | 2 | 50 | 18 Mar. (78) | 6 Fri. | 222 | .666 | 9981 | 372 | 265 | 4150 |
| | | | | | 23 Mar. (82) | 5 Thur. | 22 | 36 | 9 | 2 | 7 Mar. (66) | 3 Tues. | 134 | .402 | 9857 | 219 | 235 | 4151 |
| 1 Chaitra..... | 9734 | 29.201 | 41 | 0.123 | 23 Mar. (82) | 6 Fri. | 38 | 7 | 15 | 15 | 25 Feb. (56) | 1 Sun. | 298 | .894 | 71 | 103 | 206 | 4152 |
| | | | | | 23 Mar. (82) | 0 Sat. | 53 | 39 | 21 | 27 | 16 Mar. (75) | 0 Sat. | 180 | .540 | 106 | 39 | 258 | 4153 |
| 10 Pausha..... | 9876 | 29.629 | 184 | 0.551 | 23 Mar. (83) | 2 Mon. | 9 | 10 | 3 | 40 | 4 Mar. (64) | 4 Wed. | 30 | .090 | 9982 | 886 | 227 | 4154 |
| | | | | | 23 Mar. (82) | 3 Tues. | 24 | 41 | 9 | 52 | 22 Feb. (53) | 2 Mon. | 200 | .600 | 196 | 769 | 199 | 4155 |
| | | | | | 23 Mar. (82) | 4 Wed. | 40 | 12 | 16 | 5 | 13 Mar. (72) | 1 Sun. | 236 | .708 | 231 | 705 | 250 | 4156 |
| 6 Bhâdrapada | 9712 | 29.136 | 19 | 0.058 | 23 Mar. (82) | 5 Thur. | 55 | 44 | 22 | 17 | 2 Mar. (61) | 5 Thur. | 202 | .606 | 107 | 553 | 219 | 4157 |
| | | | | | 23 Mar. (83) | 0 Sat. | 11 | 15 | 4 | 30 | 20 Mar. (80) | 4 Wed. | 291 | .872 | 141 | 489 | 271 | 4158 |
| | | | | | 23 Mar. (82) | 1 Sun. | 26 | 46 | 10 | 42 | 9 Mar. (68) | 1 Sun. | 277 | .831 | 17 | 336 | 240 | 4159 |
| 3 Jyeshṭha... | 9855 | 29.564 | 162 | 0.486 | 23 Mar. (82) | 2 Mon. | 42 | 17 | 16 | 55 | 26 Feb. (57) | 5 Thur. | 162 | .486 | 9892 | 183 | 209 | 4160 |
| | | | | | 23 Mar. (82) | 3 Tues. | 57 | 49 | 23 | 7 | 17 Mar. (76) | 4 Wed. | 162 | .486 | 9927 | 119 | 260 | 4161 |
| 12 Phâlguna... | 9997 | 29.992 | 305 | 0.914 | 23 Mar. (83) | 5 Thur. | 13 | 20 | 5 | 20 | 6 Mar. (66) | 2 Mon. | 285 | .855 | 142 | 3 | 232 | 4162 |
| | | | | | 23 Mar. (82) | 6 Fri. | 28 | 51 | 11 | 32 | 23 Feb. (54) | 6 Fri. | 47 | .141 | 17 | 850 | 201 | 4163 |
| | | | | | 23 Mar. (82) | 0 Sat. | 44 | 22 | 17 | 45 | 14 Mar. (73) | 5 Thur. | 56 | .168 | 52 | 786 | 253 | 4164 |
| 8 Kârttika.... | 9833 | 29.498 | 140 | 0.420 | 23 Mar. (82) | 1 Sun. | 59 | 54 | 23 | 57 | 4 Mar. (63) | 3 Tues. | 285 | .855 | 266 | 669 | 225 | 4165 |
| | | | | | 23 Mar. (83) | 3 Tues. | 15 | 25 | 6 | 10 | 21 Mar. (81) | 1 Sun. | 43 | .129 | 9962 | 569 | 273 | 4166 |
| | | | | | 23 Mar. (82) | 4 Wed. | 30 | 56 | 12 | 22 | 10 Mar. (69) | 5 Thur. | 49 | .147 | 9838 | 416 | 242 | 4167 |
| 5 Śrâvaṇa..... | 9976 | 29.927 | 283 | 0.849 | 23 Mar. (82) | 5 Thur. | 46 | 27 | 18 | 35 | 28 Feb. (59) | 3 Tues. | 327 | .981 | 52 | 300 | 214 | 4168 |
| | | | | | 24 Mar. (83) | 0 Sat. | 1 | 59 | 0 | 47 | 18 Mar. (77) | 1 Sun. | 21 | .063 | 9748 | 199 | 263 | 4169 |
| | | | | | 23 Mar. (83) | 1 Sun. | 17 | 30 | 7 | 0 | 7 Mar. (67) | 6 Fri. | 173 | .519 | 9963 | 83 | 235 | 4170 |

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara | | True. | | | | |
| | | | | | | | | | Time of the preceding sankranti expressed in | | Time of the succeeding sankranti expressed in | |
| Kali. | Saka. | Chaitradi. Vikrama. | Meshadi (Saura) year in Bengal. | Kollam. | A. D. | Luni-Solar cycle. (Southern.) | Brihaspati cycle (Northern) current at Mesha sankranti. | Name of month. | Lunation parts (t.) | Tithis. | Lunation parts (t.) | Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4171 | 992 | 1127 | 476 | 244-45 | 1069- 70 | 43 Saumya ... | 45 Virodhakrit ... | 3 Jyeshtha | 9864 | 29.592 | 612 | 1.836 |
| 4172 | 993 | 1128 | 477 | 245-46 | 1070- 71 | 44 Sadharana ... | 46 Paridhavin ... | ... | ... | ... | ... | ... |
| 4173 | 994 | 1129 | 478 | 246-47 | 1071- 72 | 45 Virodhakrit ... | 47 Pramadin ... | 7 Asvina. | 9901 | 29.703 | 258 | 0.774 |
| 4174 | 995 | 1130 | 479 | 247-48 | *1072- 73 | 46 Paridhavin ... | 48 Ananda ... | ... | ... | ... | ... | ... |
| 4175 | 996 | 1131 | 480 | 248-49 | 1073- 74 | 47 Pramadin ... | 49 Rakshasa ... | ... | ... | ... | ... | ... |
| 4176 | 997 | 1132 | 481 | 249-50 | 1074- 75 | 48 Ananda ... | 50 Anala ... | 5 Sravana | 9571 | 28.713 | 217 | 0.651 |
| 4177 | 998 | 1133 | 482 | 250-51 | 1075- 76 | 49 Rakshasa ... | 51 Pingala ... | ... | ... | ... | ... | ... |
| 4178 | 999 | 1134 | 483 | 251-52 | *1076- 77 | 50 Anala ... | 52 Kalayukta ... | ... | ... | ... | ... | ... |
| 4179 | 1000 | 1135 | 484 | 252-53 | 1077- 78 | 51 Pingala ... | 53 Siddharthin ... | 3 Jyeshtha. | 9404 | 28.212 | 125 | 0.375 |
| 4180 | 1001 | 1136 | 485 | 253-54 | 1078- 79 | 52 Kalayukta ... | 54 Raudra ... | ... | ... | ... | ... | ... |
| 4181 | 1002 | 1137 | 486 | 254-55 | 1079- 80 | 53 Siddharthin ... | 55 Durmati [1] ... | ... | ... | ... | ... | ... |
| 4182 | 1003 | 1138 | 487 | 255-56 | *1080- 81 | 54 Raudra ... | 57 Rudhirodgarin | 2 Vaisakha | 9756 | 29.268 | 281 | 0.843 |
| 4183 | 1004 | 1139 | 488 | 256-57 | 1081- 82 | 55 Durmati ... | 58 Raktaksha. | ... | ... | ... | ... | ... |
| 4184 | 1005 | 1140 | 489 | 257-58 | 1082- 83 | 56 Dundubhi ... | 59 Krodhana ... | 6 Bhadrapada. | 9733 | 29.199 | 329 | 0.987 |
| 4185 | 1006 | 1141 | 490 | 258-59 | 1083- 84 | 57 Rudhirodgarin | 60 Kshaya | ... | ... | ... | ... | ... |
| 4186 | 1007 | 1142 | 491 | 259-60 | *1084- 85 | 58 Raktaksha ... | 1 Prabhava ... | ... | ... | ... | ... | ... |
| 4187 | 1008 | 1143 | 492 | 260-61 | 1085- 86 | 59 Krodhana ... | 2 Vibhava ... | 4 Ashadha | 9629 | 28.887 | 282 | 0.846 |
| 4188 | 1009 | 1144 | 493 | 261-62 | 1086- 87 | 60 Kshaya ... | 3 Sukla ... | ... | ... | ... | ... | ... |
| 4189 | 1010 | 1145 | 494 | 262-63 | 1087- 88 | 1 Prabhava ... | 4 Pramoda | ... | ... | ... | ... | ... |
| 4190 | 1011 | 1146 | 495 | 263-64 | *1088- 89 | 2 Vibhava ... | 5 Prajapati ... | 3 Jyeshtha | 9819 | 29.457 | 605 | 1.815 |
| 4191 | 1012 | 1147 | 496 | 264-65 | 1089- 90 | 3 Sukla ... | 6 Angiras ... | ... | ... | ... | ... | ... |
| 4192 | 1013 | 1148 | 497 | 265-66 | 1090- 91 | 4 Pramoda ... | 7 Srimukha ... | 7 Asvina. | 9875 | 29.625 | 271 | 0.813 |
| 4193 | 1014 | 1149 | 498 | 266-67 | 1091- 92 | 5 Prajapati ... | 8 Bhava ... | ... | ... | ... | ... | ... |
| 4194 | 1015 | 1150 | 499 | 267-68 | *1092- 93 | 6 Angiras ... | 9 Yuvan ... | ... | ... | ... | ... | ... |
| 4195 | 1016 | 1151 | 500 | 268-69 | 1093- 94 | 7 Srimukha ... | 10 Dhatri ... | 5 Sravana. | 9763 | 29.289 | 336 | 1.008 |
| 4196 | 1017 | 1152 | 501 | 269-70 | 1094- 95 | 8 Bhava ... | 11 Isvara ... | ... | ... | ... | ... | ... |
| 4197 | 1018 | 1153 | 502 | 270-71 | 1095- 96 | 9 Yuvan ... | 12 Bahudhanya ... | ... | ... | ... | ... | ... |
| 4198 | 1019 | 1154 | 503 | 271-72 | *1096- 97 | 10 Dhatri ... | 13 Pramathin ... | 3 Jyeshtha | 9363 | 28.089 | 147 | 0.441 |
| 4199 | 1020 | 1155 | 504 | 272-73 | 1097- 98 | 11 Isvara ... | 14 Vikrama ... | ... | ... | ... | ... | ... |
| 4200 | 1021 | 1156 | 505 | 273-74 | 1098- 99 | 12 Bahudhanya ... | 15 Vrisha ... | ... | ... | ... | ... | ... |
| 4201 | 1022 | 1157 | 506 | 274-75 | 1099-100 | 13 Pramathin ... | 16 Chitrabhanu | 2 Vaisakha. | 9885 | 29.655 | 323 | 0.969 |
| 4202 | 1023 | 1158 | 507 | 275-76 | *1100- 1 | 14 Vikrama ... | 17 Subhanu ... | ... | ... | ... | ... | ... |

[1] Dundubhi, No. 56, was suppressed in the north.

# TABLE I.

(*Col.* 23) *a* = *Distance of moon from sun.* (*Col.* 24) *b* = *moon's mean anomaly.* (*Col.* 25) *c* = *sun's mean anomaly.*

| II. ADDED LUNAR MONTHS (*continued.*) | | | | | III. COMMENCEMENT OF THE | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean. | | | | | Solar year. | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | Kali. |
| Name of month. | Time of the preceding saṅkrānti expressed in: Lunation parts. (*t*) | Time of the preceding saṅkrānti expressed in: Tithis. | Time of the succeeding saṅkrānti expressed in: Lunation parts. (*t*) | Time of the succeeding saṅkrānti expressed in: Tithis. | Day and Month A. D. | (Time of the Mesha saṅkrānti.) Week day. | By the Ārya Siddhānta. Gh. | Pa. | H. | M. | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. Moon's Age. Lunat. parts elapsed. (*t*) | Tithis elapsed. | *a* | *b* | *c* | |
| 8a | 9a | 10a | 11a | 12a | 13 | 14 | 15 | | 17 | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 1 Chaitra . . . . | 9811 | 29.433 | 118 | 0.353 | 23 Mar. (82) | 2 Mon. | 33 | 1 | 13 | 12 | 25 Feb. (56) | 4 Wed. | 289 | .867 | 177 | 960 | 207 | 4171 |
| | | | | | 23 Mar. (82) | 3 Tues. | 48 | 32 | 19 | 25 | 16 Mar. (75) | 3 Tues. | 271 | .813 | 212 | 902 | 258 | 4172 |
| 10 Pausha . . . . | 9954 | 29.861 | 261 | 0.783 | 24 Mar. (83) | 5 Thur. | 4 | 4 | 1 | 37 | 5 Mar. (64) | 0 Sat. | 87 | .261 | 87 | 749 | 227 | 4173 |
| | | | | | 23 Mar. (83) | 6 Fri. | 19 | 35 | 7 | 50 | 23 Mar. (83) | 6 Fri. | 134 | .402 | 122 | 686 | 278 | 4174 |
| | | | | | 23 Mar. (82) | 0 Sat. | 35 | 6 | 14 | 2 | 12 Mar. (71) | 3 Tues. | 110 | .330 | 9998 | 533 | 248 | 4175 |
| 6 Bhādrapada . | 9780 | 29.367 | 97 | 0.290 | 23 Mar. (82) | 1 Sun. | 50 | 37 | 20 | 15 | 1 Mar. (60) | 0 Sat. | 111 | .333 | 9874 | 380 | 217 | 4176 |
| | | | | | 24 Mar. (83) | 3 Tues. | 6 | 9 | 2 | 27 | 20 Mar. (79) | 6 Fri. | 176 | .528 | 9906 | 316 | 268 | 4177 |
| | | | | | 23 Mar. (83) | 4 Wed. | 21 | 40 | 8 | 40 | 8 Mar. (68) | 3 Tues. | 44 | .132 | 9784 | 165 | 237 | 4178 |
| 3 Jyeshṭha . . . . | 9932 | 29.796 | 239 | 0.718 | 23 Mar. (82) | 5 Thur. | 37 | 11 | 14 | 52 | 26 Feb. (57) | 1 Sun. | 181 | .543 | 9998 | 47 | 209 | 4179 |
| | | | | | 23 Mar. (82) | 6 Fri. | 52 | 42 | 21 | 5 | 17 Mar. (76) | 0 Sat. | 158 | .474 | 33 | 983 | 260 | 4180 |
| 11 Māgha . . . . . . | 9707 | 29.302 | 75 | 0.224 | 24 Mar. (83) | 1 Sun. | 8 | 14 | 3 | 17 | 7 Mar. (66) | 5 Thur. | 283 | .849 | 247 | 866 | 232 | 4181 |
| | | | | | 23 Mar. (83) | 2 Mon. | 23 | 45 | 9 | 30 | 24 Feb. (55) | 2 Mon. | 130 | .390 | 123 | 713 | 202 | 4182 |
| | | | | | 23 Mar. (82) | 3 Tues. | 39 | 16 | 15 | 42 | 14 Mar. (73) | 1 Sun. | 186 | .558 | 158 | 649 | 253 | 4183 |
| 8 Kārttika . . . . | 9910 | 29.730 | 217 | 0.652 | 23 Mar. (82) | 4 Wed. | 54 | 47 | 21 | 55 | 3 Mar. (62) | 5 Thur. | 177 | .531 | 33 | 497 | 222 | 4184 |
| | | | | | 24 Mar. (83) | 6 Fri. | 10 | 19 | 4 | 7 | 22 Mar. (81) | 4 Wed. | 266 | .798 | 68 | 432 | 273 | 4185 |
| | | | | | 23 Mar. (83) | 0 Sat. | 25 | 50 | 10 | 20 | 10 Mar. (70) | 1 Sun. | 221 | .663 | 9944 | 280 | 243 | 4186 |
| 4 Āshāḍha . . . . | 9745 | 29.236 | 53 | 0.159 | 23 Mar. (82) | 1 Sun. | 41 | 21 | 16 | 32 | 27 Feb. (58) | 5 Thur. | 61 | .183 | 9819 | 127 | 212 | 4187 |
| | | | | | 23 Mar. (82) | 2 Mon. | 56 | 52 | 22 | 45 | 18 Mar. (77) | 4 Wed. | 48 | .144 | 9854 | 63 | 263 | 4188 |
| | | | | | 24 Mar. (83) | 4 Wed. | 12 | 24 | 4 | 57 | 8 Mar. (67) | 2 Mon. | 161 | .483 | 68 | 946 | 235 | 4189 |
| 1 Chaitra . . . . . | 9888 | 29.665 | 196 | 0.587 | 23 Mar. (83) | 5 Thur. | 27 | 55 | 11 | 10 | 26 Feb. (57) | 0 Sat. | 302 | .906 | 283 | 830 | 207 | 4190 |
| | | | | | 23 Mar. (82) | 6 Fri. | 43 | 26 | 17 | 22 | 16 Mar. (75) | 6 Fri. | 318 | .954 | 317 | 760 | 258 | 4191 |
| 9 Mārgaśīrsha . | 9724 | 29.171 | 31 | 0.093 | 23 Mar. (82) | 0 Sat. | 58 | 57 | 23 | 35 | 5 Mar. (64) | 3 Tues. | 241 | .723 | 193 | 615 | 227 | 4192 |
| | | | | | 24 Mar. (83) | 2 Mon. | 14 | 29 | 5 | 47 | 23 Mar. (82) | 1 Sun. | 18 | .054 | 9889 | 513 | 276 | 4193 |
| | | | | | 23 Mar. (83) | 3 Tues. | 30 | 0 | 12 | 0 | 12 Mar. (72) | 6 Fri. | 328 | .984 | 103 | 396 | 248 | 4194 |
| 6 Bhādrapada . . | 9866 | 29.599 | 174 | 0.521 | 23 Mar. (82) | 4 Wed. | 45 | 31 | 18 | 12 | 1 Mar. (60) | 3 Tues. | 260 | .780 | 9979 | 243 | 217 | 4195 |
| | | | | | 24 Mar. (83) | 6 Fri. | 1 | 2 | 0 | 25 | 20 Mar. (79) | 2 Mon. | 281 | .843 | 14 | 180 | 268 | 4196 |
| | | | | | 24 Mar. (83) | 0 Sat. | 16 | 34 | 6 | 37 | 9 Mar. (68) | 6 Fri. | 52 | .156 | 9880 | 27 | 237 | 4197 |
| 2 Vaiśākha . . . . | 9702 | 29.105 | 9 | 0.028 | 23 Mar. (83) | 1 Sun. | 32 | 5 | 12 | 50 | 27 Feb. (58) | 4 Wed. | 171 | .513 | 104 | 910 | 209 | 4198 |
| | | | | | 23 Mar. (82) | 2 Mon. | 47 | 36 | 19 | 2 | 17 Mar. (76) | 3 Tues. | 163 | .489 | 138 | 846 | 261 | 4199 |
| 11 Māgha . . . . . | 9845 | 29.534 | 152 | 0.456 | 24 Mar. (83) | 4 Wed. | 3 | 7 | 1 | 15 | 6 Mar. (65) | 0 Sat. | 23 | .069 | 14 | 693 | 230 | 4200 |
| | | | | | 24 Mar. (83) | 5 Thur. | 18 | 39 | 7 | 27 | 24 Feb. (55) | 5 Thur. | 306 | .918 | 229 | 577 | 202 | 4201 |
| | | | | | 23 Mar. (83) | 6 Fri. | 34 | 10 | 13 | 40 | 13 Mar. (73) | 3 Tues. | 85 | .255 | 9925 | 477 | 250 | 4202 |

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR | | | | | | | | II. ADDED LUNAR MONTHS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara | | True | | | | |
| Kali | Śaka | Chaitrâdi Vikrama | Meshâdi (Solar) year in Bengal | Kollam. | A. D. | Luni-Solar cycle (Southern.) | Bṛihaspati cycle (Northern) current at Mesha saṅkrânti | Name of month | Time of the preceding saṅkrânti expressed in: Lunation parts. (*t.*) | Time of the preceding saṅkrânti expressed in: Tithis. | Time of the succeeding saṅkrânti expressed in: Lunation parts. (*t.*) | Time of the succeeding saṅkrânti expressed in: Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4203 | 1024 | 1159 | 508 | 276- 77 | 1101- 2 | 15 Vṛisha | 18 Târaṇa | 6 Bhâdrapada | 9818 | 29.454 | 328 | 0.984 |
| 4204 | 1025 | 1160 | 509 | 277- 78 | 1102- 3 | 16 Chitrabhânu | 19 Pârthiva | | | | | |
| 4205 | 1026 | 1161 | 510 | 278- 79 | 1103- 4 | 17 Subhânu | 20 Vyaya | | | | | |
| 4206 | 1027 | 1162 | 511 | 279- 80 | *1104- 5 | 18 Târaṇa | 21 Sarvajit | 4 Âshâḍha | 9677 | 29.031 | 453 | 1.359 |
| 4207 | 1028 | 1163 | 512 | 280- 81 | 1105- 6 | 19 Pârthiva | 22 Sarvadhârin | | | | | |
| 4208 | 1029 | 1164 | 513 | 281- 82 | 1106- 7 | 20 Vyaya | 23 Virodhin | | | | | |
| 4209 | 1030 | 1165 | 514 | 282- 83 | 1107- 8 | 21 Sarvajit | 24 Vikṛita | 3 Jyeshṭha | 9830 | 29.490 | 563 | 1.689 |
| 4210 | 1031 | 1166 | 515 | 283- 84 | *1108- 9 | 22 Sarvadhârin | 25 Khara | | | | | |
| 4211 | 1032 | 1167 | 516 | 284- 85 | 1109-10 | 23 Virodhin | 26 Nandana | 7 Âśvina | 9852 | 29.556 | 230 | 0.690 |
| 4212 | 1033 | 1168 | 517 | 285- 86 | 1110-11 | 24 Vikṛita | 27 Vijaya | | | | | |
| 4213 | 1034 | 1169 | 518 | 286- 87 | 1111-12 | 25 Khara | 28 Jaya | | | | | |
| 4214 | 1035 | 1170 | 519 | 287- 88 | *1112-13 | 26 Nandana | 29 Manmatha | 5 Śrâvaṇa | 9941 | 29.823 | 524 | 1.572 |
| 4215 | 1036 | 1171 | 520 | 288- 89 | 1113-14 | 27 Vijaya | 30 Durmukha | | | | | |
| 4216 | 1037 | 1172 | 521 | 289- 90 | 1114-15 | 28 Jaya | 31 Hemalamba | | | | | |
| 4217 | 1038 | 1173 | 522 | 290- 91 | 1115-16 | 29 Manmatha | 32 Vilamba | 3 Jyeshṭha | 9349 | 28.047 | 107 | 0.321 |
| 4218 | 1039 | 1174 | 523 | 291- 92 | *1116-17 | 30 Durmukha | 33 Vikârin | | | | | |
| 4219 | 1040 | 1175 | 524 | 292- 93 | 1117-18 | 31 Hemalamba | 34 Śârvari | | | | | |
| 4220 | 1041 | 1176 | 525 | 293- 94 | 1118-19 | 32 Vilamba | 35 Plava | 1 Chaitra | 9876 | 29.628 | 78 | 0.234 |
| 4221 | 1042 | 1177 | 526 | 294- 95 | 1119-20 | 33 Vikârin | 36 Śubhakṛit | | | | | |
| 4222 | 1043 | 1178 | 527 | 295- 96 | *1120-21 | 34 Śârvari | 37 Śobhana | 6 Bhâdrapada | 9990 | 29.970 | 421 | 1.263 |
| 4223 | 1044 | 1179 | 528 | 296- 97 | 1121-22 | 35 Plava | 38 Krodhin | | | | | |
| 4224 | 1045 | 1180 | 529 | 297- 98 | 1122-23 | 36 Śubhakṛit | 39 Viśvâvasu | | | | | |
| 4225 | 1046 | 1181 | 530 | 298- 99 | 1123-24 | 37 Śobhana | 40 Parâbhava | 4 Âshâḍha | 9655 | 28.965 | 512 | 1.536 |
| 4226 | 1047 | 1182 | 531 | 299-300 | *1124-25 | 38 Krodhin | 41 Plavaṅga | | | | | |
| 4227 | 1048 | 1183 | 532 | 300- 1 | 1125-26 | 39 Viśvâvasu | 42 Kîlaka | | | | | |
| 4228 | 1049 | 1184 | 533 | 301- 2 | 1126-27 | 40 Parâbhava | 43 Saumya | 3 Jyeshṭha | 9939 | 29.817 | 575 | 1.725 |
| 4229 | 1050 | 1185 | 534 | 302- 3 | 1127-28 | 41 Plavaṅga | 44 Sâdhâraṇa | | | | | |
| 4230 | 1051 | 1186 | 535 | 303- 4 | *1128-29 | 42 Kîlaka | 45 Virodhakṛit | 7 Âśvina | 9910 | 29.730 | 223 | 0.669 |
| 4231 | 1052 | 1187 | 536 | 304- 5 | 1129-30 | 43 Saumya | 46 Paridhâvin | | | | | |
| 4232 | 1053 | 1188 | 537 | 305- 6 | 1130-31 | 44 Sâdhâraṇa | 47 Pramâdin | | | | | |
| 4233 | 1054 | 1189 | 538 | 306- 7 | 1131-32 | 45 Virodhakṛit | 48 Ânanda | 4 Âshâḍha | 9201 | 27.603 | 37 | 0.111 |
| 4234 | 1055 | 1190 | 539 | 307- 8 | *1132-33 | 46 Paridhâvin | 49 Râkshasa | | | | | |
| 4235 | 1056 | 1191 | 540 | 308- 9 | 1133-34 | 47 Pramâdin | 50 Anala | | | | | |

# TABLE I.

(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.

## III. COMMENCEMENT OF THE

| Solar year. | | | | | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | Kali |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Day and Month. A. D. | (Time of the Mesha saṅkrânti.) | | | | | | | | | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. | | | | | Kali |
| | Week day. | By the Ârya Siddhânta | | | | By the Sûrya Siddhânta. | | | | | | Moon's Age | | a. | b. | c. | |
| | | Gh. | Pa. | H. | M. | Gh. | Pa. | H. | M. | | | Lunar parts elapsed (t) | Tithis elapsed | | | | |
| 13 | 14 | 15 | | 17 | | 15a | | 17a | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 23 Mar. (82) | 0 Sat. | 49 | 41 | 19 | 52 | 52 | 27 | 20 | 59 | 2 Mar. (61) | 0 Sat. | 66 | .198 | 9900 | 324 | 220 | 4203 |
| 24 Mar. (83) | 2 Mon. | 5 | 12 | 2 | 5 | 7 | 58 | 3 | 11 | 21 Mar. (80) | 6 Fri. | 115 | .345 | 9835 | 260 | 271 | 4204 |
| 24 Mar. (83) | 3 Tues. | 20 | 44 | 8 | 17 | 23 | 30 | 9 | 24 | 11 Mar. (70) | 4 Wed. | 298 | .894 | 49 | 143 | 243 | 4205 |
| 23 Mar. (83) | 4 Wed. | 36 | 15 | 14 | 30 | 39 | 1 | 15 | 36 | 28 Feb. (59) | 1 Sun. | 59 | .177 | 9925 | 991 | 212 | 4206 |
| 23 Mar. (82) | 5 Thur. | 51 | 46 | 20 | 42 | 54 | 33 | 21 | 49 | 18 Mar. (77) | 0 Sat. | 38 | .114 | 9960 | 927 | 263 | 4207 |
| 24 Mar. (83) | 0 Sat. | 7 | 17 | 2 | 55 | 10 | 4 | 4 | 2 | 8 Mar. (67) | 5 Thur. | 184 | .552 | 174 | 810 | 235 | 4208 |
| 24 Mar. (83) | 1 Sun. | 22 | 49 | 9 | 7 | 25 | 36 | 10 | 14 | 25 Feb. (56) | 2 Mon. | 77 | .231 | 50 | 657 | 204 | 4209 |
| 23 Mar. (83) | 2 Mon. | 38 | 20 | 15 | 20 | 41 | 7 | 16 | 27 | 15 Mar. (74) | 1 Sun. | 146 | .438 | 84 | 593 | 256 | 4210 |
| 23 Mar. (82) | 3 Tues. | 53 | 51 | 21 | 32 | 56 | 39 | 22 | 39 | 4 Mar. (63) | 5 Thur. | 152 | .456 | 9960 | 440 | 225 | 4211 |
| 24 Mar. (83) | 5 Thur. | 9 | 22 | 3 | 45 | 12 | 10 | 4 | 52 | 23 Mar. (82) | 4 Wed. | 234 | .702 | 9997 | 376 | 276 | 4212 |
| 24 Mar. (83) | 6 Fri. | 24 | 54 | 9 | 57 | 27 | 42 | 11 | 5 | 12 Mar. (71) | 1 Sun. | 148 | .444 | 9870 | 224 | 245 | 4213 |
| 23 Mar. (83) | 0 Sat. | 40 | 25 | 16 | 10 | 43 | 13 | 17 | 17 | 1 Mar. (61)† | 6 Fri. | 314 | .942 | 85 | 107 | 217 | 4214 |
| 23 Mar. (82) | 1 Sun. | 55 | 56 | 22 | 22 | 58 | 45 | 23 | 30 | 20 Mar. (79) | 5 Thur. | 297 | .891 | 119 | 43 | 209 | 4215 |
| 24 Mar. (83) | 3 Tues. | 11 | 27 | 4 | 35 | 14 | 16 | 5 | 43 | 9 Mar. (68) | 2 Mon. | 45 | .135 | 9995 | 890 | 238 | 4216 |
| 24 Mar. (83) | 4 Wed. | 26 | 59 | 10 | 47 | 29 | 48 | 11 | 55 | 27 Feb. (58) | 0 Sat. | 214 | .642 | 210 | 774 | 210 | 4217 |
| 23 Mar. (83) | 5 Thur. | 42 | 30 | 17 | 0 | 45 | 19 | 18 | 8 | 17 Mar. (77) | 6 Fri. | 248 | .744 | 244 | 710 | 261 | 4218 |
| 23 Mar. (82) | 6 Fri. | 58 | 1 | 23 | 12 | †0 | 51 | †0 | 20 | 6 Mar. (65) | 3 Tues. | 210 | .630 | 120 | 557 | 230 | 4219 |
| 24 Mar. (83) | 1 Sun. | 13 | 32 | 5 | 25 | 16 | 22 | 6 | 33 | 23 Feb. (54) | 0 Sat. | 218 | .654 | 9993 | 404 | 199 | 4220 |
| 24 Mar. (83) | 2 Mon. | 29 | 4 | 11 | 37 | 31 | 54 | 12 | 46 | 14 Mar. (73) | 6 Fri. | 288 | .864 | 30 | 340 | 251 | 4221 |
| 23 Mar. (83) | 3 Tues. | 44 | 35 | 17 | 50 | 47 | 25 | 18 | 58 | 2 Mar. (62) | 3 Tues. | 176 | .528 | 9906 | 187 | 220 | 4222 |
| 24 Mar. (83) | 5 Thur. | 0 | 6 | 0 | 2 | 2 | 57 | 1 | 11 | 21 Mar. (80) | 2 Mon. | 179 | .537 | 9941 | 123 | 271 | 4223 |
| 24 Mar. (83) | 6 Fri. | 15 | 37 | 6 | 15 | 18 | 29 | 7 | 23 | 11 Mar. (70) | 0 Sat. | 301 | .903 | 155 | 7 | 243 | 4224 |
| 24 Mar. (83) | 0 Sat. | 31 | 9 | 12 | 27 | 34 | 0 | 13 | 36 | 28 Feb. (59) | 4 Wed. | 62 | .186 | 31 | 854 | 212 | 4225 |
| 23 Mar. (83) | 1 Sun. | 46 | 40 | 18 | 40 | 49 | 32 | 19 | 49 | 18 Mar. (78) | 3 Tues. | 69 | .207 | 65 | 790 | 264 | 4226 |
| 24 Mar. (83) | 3 Tues. | 2 | 11 | 0 | 52 | 5 | 3 | 2 | 1 | 8 Mar. (67) | 1 Sun. | 296 | .888 | 280 | 674 | 235 | 4227 |
| 24 Mar. (83) | 4 Wed. | 17 | 42 | 7 | 5 | 20 | 35 | 8 | 14 | 25 Feb. (56) | 5 Thur. | 279 | .837 | 155 | 521 | 205 | 4228 |
| 24 Mar. (83) | 5 Thur. | 33 | 14 | 13 | 17 | 36 | 6 | 14 | 26 | 15 Mar. (74) | 3 Tues. | 59 | .177 | 9851 | 420 | 253 | 4229 |
| 23 Mar. (83) | 6 Fri. | 48 | 45 | 19 | 30 | 51 | 38 | 20 | 39 | 3 Mar. (63) | 0 Sat. | 7 | .021 | 9727 | 268 | 222 | 4230 |
| 24 Mar. (83) | 1 Sun. | 4 | 16 | 1 | 42 | 7 | 9 | 2 | 52 | 22 Mar. (81) | 6 Fri. | 36 | .108 | 9762 | 204 | 274 | 4231 |
| 24 Mar. (83) | 2 Mon. | 19 | 47 | 7 | 55 | 22 | 41 | 9 | 4 | 12 Mar. (71) | 4 Wed. | 189 | .567 | 9976 | 67 | 246 | 4232 |
| 24 Mar. (83) | 3 Tues. | 35 | 19 | 14 | 7 | 38 | 12 | 15 | 17 | 2 Mar. (61) | 2 Mon. | 306 | .918 | 190 | 971 | 218 | 4233 |
| 23 Mar. (83) | 4 Wed. | 50 | 50 | 20 | 20 | 53 | 44 | 21 | 30 | 20 Mar. (80) | 1 Sun. | 288 | .864 | 225 | 907 | 269 | 4234 |
| 24 Mar. (83) | 6 Fri. | 6 | 21 | 2 | 32 | 9 | 15 | 3 | 42 | 9 Mar. (68) | 5 Thur. | 101 | .303 | 101 | 754 | 238 | 4235 |

† Wherever these marks occur the day of the month and week-day in cols. 13, 14 should, for Sûrya Siddhânta calculations, be advanced by 1. Thus in A.D. 1117-18 the Mesha saṅkrânti date by the Sûrya Siddhânta is March 24th, (0) Saturday.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR | | | | | | | | II. ADDED LUNAR MONTHS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| Kali. | Saka. | Chaitrâdi. Vikrama. | Mashdi (Solar) year in Bengal. | Kollam. | A. D. | Luni-Solar cycle. (Southern.) | Brihaspati cycle (Northern) current at Mesha saṅkrânti. | Name of month. | Time of the preceding saṅkrânti expressed in: Lunation parts. (t.) | Time of the preceding saṅkrânti expressed in: Tithis. | Time of the succeeding saṅkrânti expressed in: Lunation parts. (t.) | Time of the succeeding saṅkrânti expressed in: Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4236 | 1057 | 1192 | 541 | 309-10 | 1134-35 | 48 Ânanda | 51 Piṅgala | 3 Jyeshṭha | 9122 | 27.366 | 92 | 0.276 |
| 4237 | 1058 | 1193 | 542 | 310-11 | 1135-36 | 49 Râkshasa | 52 Kâlayukta | ... | ... | ... | ... | ... |
| 4238 | 1059 | 1194 | 543 | 311-12 | *1136-37 | 50 Anala | 53 Siddhârthin | ... | ... | ... | ... | ... |
| 4239 | 1060 | 1195 | 544 | 312-13 | 1137-38 | 51 Piṅgala | 54 Raudra | 1 Chaitra | 9987 | 29.961 | 212 | 0.636 |
| 4240 | 1061 | 1196 | 545 | 313-14 | 1138-39 | 52 Kâlayukta | 55 Durmati | ... | ... | ... | ... | ... |
| 4241 | 1062 | 1197 | 546 | 314-15 | 1139-40 | 53 Siddhârthin | 56 Dundubhi | 5 Śrâvaṇa | 9547 | 28.641 | 182 | 0.546 |
| 4242 | 1063 | 1198 | 547 | 315-16 | *1140-41 | 54 Raudra | 57 Rudhirodgârin | ... | ... | ... | ... | ... |
| 4243 | 1064 | 1199 | 548 | 316-17 | 1141-42 | 55 Durmati | 58 Raktâksha | ... | ... | ... | ... | ... |
| 4244 | 1065 | 1200 | 549 | 317-18 | 1142-43 | 56 Dundubhi | 59 Krodhana | 4 Âshâḍha | 9623 | 28.869 | 490 | 1.470 |
| 4245 | 1066 | 1201 | 550 | 318-19 | 1143-44 | 57 Rudhirodgârin | 60 Kshaya | ... | ... | ... | ... | ... |
| 4246 | 1067 | 1202 | 551 | 319-20 | *1144-45 | 58 Raktâksha | 1 Prabhava | ... | ... | ... | ... | ... |
| 4247 | 1068 | 1203 | 552 | 320-21 | 1145-46 | 59 Krodhana | 2 Vibhava | 2 Vaiśâkha | 9733 | 29.199 | 136 | 0.408 |
| 4248 | 1069 | 1204 | 553 | 321-22 | 1146-47 | 60 Kshaya | 3 Śukla | ... | ... | ... | ... | ... |
| 4249 | 1070 | 1205 | 554 | 322-23 | 1147-48 | 1 Prabhava | 4 Pramoda | 6 Bhâdrapada | 9655 | 28.965 | 65 | 0.195 |
| 4250 | 1071 | 1206 | 555 | 323-24 | *1148-49 | 2 Vibhava | 5 Prajâpati | ... | ... | ... | ... | ... |
| 4251 | 1072 | 1207 | 556 | 324-25 | 1149-50 | 3 Śukla | 6 Aṅgiras | ... | ... | ... | ... | ... |
| 4252 | 1073 | 1208 | 557 | 325-26 | 1150-51 | 4 Pramoda | 7 Śrîmukha | 4 Âshâḍha | 9160 | 27.480 | 35 | 0.105 |
| 4253 | 1074 | 1209 | 558 | 326-27 | 1151-52 | 5 Prajâpati | 8 Bhâva | ... | ... | ... | ... | ... |
| 4254 | 1075 | 1210 | 559 | 327-28 | *1152-53 | 6 Aṅgiras | 9 Yuvan | ... | ... | ... | ... | ... |
| 4255 | 1076 | 1211 | 560 | 328-29 | 1153-54 | 7 Śrîmukha | 10 Dhâtri | 3 Jyeshṭha | 9591 | 28.773 | 169 | 0.507 |
| 4256 | 1077 | 1212 | 561 | 329-30 | 1154-55 | 8 Bhâva | 11 Îśvara | ... | ... | ... | ... | ... |
| 4257 | 1078 | 1213 | 562 | 330-31 | 1155-56 | 9 Yuvan | 12 Bahudhânya | 12 Phâlguna | 9851 | 29.553 | 0 | 0.001 |
| 4258 | 1079 | 1214 | 563 | 331-32 | *1156-57 | 10 Dhâtri | 13 Pramâthin | ... | ... | ... | ... | ... |
| 4259 | 1080 | 1215 | 564 | 332-33 | 1157-58 | 11 Îśvara | 14 Vikrama | ... | ... | ... | ... | ... |
| 4260 | 1081 | 1216 | 565 | 333-34 | 1158-59 | 12 Bahudhânya | 15 Vṛisha | 5 Śrâvaṇa | 9578 | 28.734 | 314 | 0.942 |
| 4261 | 1082 | 1217 | 566 | 334-35 | 1159-60 | 13 Pramâthin | 16 Chitrabhânu | ... | ... | ... | ... | ... |
| 4262 | 1083 | 1218 | 567 | 335-36 | *1160-61 | 14 Vikrama | 17 Subhânu | ... | ... | ... | ... | ... |
| 4263 | 1084 | 1219 | 568 | 336-37 | 1161-62 | 15 Vṛisha | 18 Târaṇa | 4 Âshâḍha | 9664 | 28.992 | 455 | 1.365 |
| 4264 | 1085 | 1220 | 569 | 337-38 | 1162-63 | 16 Chitrabhânu | 19 Pârthiva | ... | ... | ... | ... | ... |
| 4265 | 1086 | 1221 | 570 | 338-39 | 1163-64 | 17 Subhânu | 20 Vyaya | ... | ... | ... | ... | ... |
| 4266 | 1087 | 1222 | 571 | 339-40 | *1164-65 | 18 Târaṇa | 21 Sarvajit [1] | 2 Vaiśâkha | 9849 | 29.547 | 310 | 0.930 |
| 4267 | 1088 | 1223 | 572 | 340-41 | 1165-66 | 19 Pârthiva | 23 Virodhin | ... | ... | ... | ... | ... |
| 4268 | 1089 | 1224 | 573 | 341-42 | 1166-67 | 20 Vyaya | 24 Vikṛita | 6 Bhâdrapada | 9813 | 29.439 | 261 | 0.783 |

1) Sarvadhârin, No. 22, was suppressed in the north.

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

III COMMENCEMENT OF THE

| Solar year: Day and Month. A. D. | Solar year: (Time of the Mesha sankranti.) Week day | By the Ârya Siddhânta: Gh. | Pa. | H. | M. | By the Sûrya Siddhânta: Gh. | Pa. | H. | M. | Luni-Solar year. (Civil day of Chaitra Śukla 1st.): Day and Month A. D. | Week-day. | At Sunrise on meridian of Ujjain. Moon's Age: Lunar parts elapsed (t) | Tithis elapsed | a | b | c | Kali |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | 14 | 15 | | 17 | | 15a | | 17a | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 24 Mar. (83) | 0 Sat. | 21 | 52 | 8 | 45 | 24 | 47 | 9 | 35 | 26 Feb. (57) | 2 Mon. | 34 | .102 | 9976 | 601 | 207 | 4236 |
| 24 Mar. (83) | 1 Sun. | 37 | 24 | 14 | 57 | 40 | 18 | 16 | 7 | 17 Mar. (76) | 1 Sun. | 119 | .357 | 11 | 537 | 258 | 4237 |
| 23 Mar. (83) | 2 Mon. | 52 | 55 | 21 | 10 | 55 | 50 | 22 | 20 | 5 Mar. (65) | 5 Thur. | 121 | .363 | 9887 | 384 | 228 | 4238 |
| 24 Mar. (83) | 4 Wed. | 8 | 26 | 3 | 22 | 11 | 21 | 4 | 33 | 22 Feb. (53) | 2 Mon. | 45 | .135 | 9763 | 232 | 197 | 4239 |
| 24 Mar. (83) | 5 Thur. | 23 | 57 | 9 | 35 | 26 | 53 | 10 | 45 | 13 Mar. (72) | 1 Sun. | 59 | .177 | 9797 | 168 | 248 | 4240 |
| 24 Mar. (83) | 6 Fri. | 39 | 29 | 15 | 47 | 42 | 24 | 16 | 58 | 3 Mar. (62) | 6 Fri. | 198 | .594 | 12 | 51 | 220 | 4241 |
| 23 Mar. (83) | 0 Sat. | 55 | 0 | 22 | 0 | 57 | 56 | 23 | 10 | 21 Mar. (81) | 5 Thur. | 174 | .522 | 46 | 987 | 271 | 4242 |
| 24 Mar. (83) | 2 Mon. | 10 | 31 | 4 | 12 | 13 | 27 | 5 | 23 | 11 Mar. (70) | 3 Tues. | 299 | .897 | 261 | 870 | 243 | 4243 |
| 24 Mar. (83) | 3 Tues. | 26 | 2 | 10 | 25 | 28 | 59 | 11 | 36 | 28 Feb. (59) | 0 Sat. | 141 | .423 | 136 | 718 | 212 | 4244 |
| 24 Mar. (83) | 4 Wed. | 41 | 34 | 16 | 37 | 44 | 31 | 17 | 48 | 19 Mar. (78) | 6 Fri. | 196 | .589 | 171 | 654 | 264 | 4245 |
| 23 Mar. (83) | 5 Thur. | 57 | 5 | 22 | 50 | †0 | 2 | †0 | 1 | 7 Mar. (67) | 3 Tues. | 186 | .558 | 47 | 501 | 233 | 4246 |
| 24 Mar. (83) | 0 Sat. | 12 | 36 | 5 | 2 | 15 | 34 | 6 | 15 | 24 Feb. (55) | 0 Sat. | 179 | .537 | 9922 | 348 | 202 | 4247 |
| 24 Mar. (83) | 1 Sun. | 28 | 7 | 11 | 15 | 31 | 5 | 12 | 26 | 15 Mar. (74) | 6 Fri. | 234 | .702 | 9957 | 284 | 253 | 4248 |
| 24 Mar. (83) | 2 Mon. | 43 | 39 | 17 | 27 | 46 | 37 | 18 | 39 | 4 Mar. (63) | 3 Tues. | 77 | .231 | 9833 | 131 | 223 | 4249 |
| 23 Mar. (83) | 3 Tues. | 59 | 10 | 23 | 40 | †2 | 8 | †0 | 51 | 22 Mar. (82) | 2 Mon. | 65 | .195 | 9867 | 67 | 274 | 4250 |
| 24 Mar. (83) | 5 Thur. | 14 | 41 | 5 | 52 | 17 | 40 | 7 | 4 | 12 Mar. (71) | 0 Sat. | 179 | .537 | 82 | 951 | 246 | 4251 |
| 24 Mar. (83) | 6 Fri. | 30 | 12 | 12 | 5 | 33 | 11 | 13 | 16 | 2 Mar. (61) | 5 Thur. | 316 | .948 | 296 | 834 | 218 | 4252 |
| 24 Mar. (83) | 0 Sat. | 45 | 44 | 18 | 17 | 48 | 43 | 19 | 29 | 21 Mar. (80) | 4 Wed. | 332 | .996 | 331 | 770 | 269 | 4253 |
| 24 Mar. (84) | 2 Mon. | 1 | 15 | 0 | 30 | 4 | 14 | 1 | 42 | 9 Mar. (69) | 1 Sun. | 251 | .753 | 206 | 618 | 238 | 4254 |
| 24 Mar. (83) | 3 Tues. | 16 | 46 | 6 | 42 | 19 | 46 | 7 | 54 | 26 Feb. (57) | 5 Thur. | 255 | .765 | 82 | 465 | 207 | 4255 |
| 24 Mar. (83) | 4 Wed. | 32 | 17 | 12 | 55 | 35 | 17 | 14 | 7 | 16 Mar. (75) | 3 Tues. | 23 | .069 | 9778 | 364 | 256 | 4256 |
| 24 Mar. (83) | 5 Thur. | 47 | 49 | 19 | 7 | 50 | 49 | 20 | 20 | 6 Mar. (65) | 1 Sun. | 272 | .816 | 9999 | 248 | 228 | 4257 |
| 24 Mar. (84) | 0 Sat. | 3 | 20 | 1 | 20 | 6 | 20 | 2 | 32 | 24 Mar. (84) | 0 Sat. | 296 | .888 | 27 | 184 | 279 | 4258 |
| 24 Mar. (83) | 1 Sun. | 18 | 51 | 7 | 32 | 21 | 52 | 8 | 45 | 13 Mar. (72) | 4 Wed. | 70 | .210 | 9902 | 31 | 248 | 4259 |
| 24 Mar. (83) | 2 Mon. | 34 | 22 | 13 | 45 | 37 | 23 | 14 | 57 | 3 Mar. (62) | 2 Mon. | 186 | .558 | 117 | 915 | 220 | 4260 |
| 24 Mar. (83) | 3 Tues. | 49 | 54 | 19 | 57 | 52 | 55 | 21 | 10 | 22 Mar. (81) | 1 Sun. | 179 | .537 | 152 | 851 | 272 | 4261 |
| 24 Mar. (84) | 5 Thur. | 5 | 25 | 2 | 10 | 8 | 26 | 3 | 23 | 10 Mar. (70) | 5 Thur. | 36 | .108 | 28 | 698 | 241 | 4262 |
| 24 Mar. (83) | 6 Fri. | 20 | 56 | 8 | 22 | 23 | 58 | 9 | 35 | 27 Feb. (58) | 2 Mon. | 6 | .018 | 9903 | 546 | 210 | 4263 |
| 24 Mar. (83) | 0 Sat. | 36 | 27 | 14 | 35 | 39 | 29 | 15 | 48 | 18 Mar. (77) | 1 Sun. | 95 | .285 | 9938 | 481 | 261 | 4264 |
| 24 Mar. (83) | 1 Sun. | 51 | 59 | 20 | 47 | 55 | 1 | 22 | 0 | 7 Mar. (66) | 5 Thur. | 78 | .234 | 9814 | 328 | 230 | 4265 |
| 24 Mar. (84) | 3 Tues. | 7 | 30 | 3 | 0 | 10 | 32 | 4 | 13 | 25 Feb. (56) | 3 Tues. | 307 | .921 | 28 | 212 | 202 | 4266 |
| 24 Mar. (83) | 4 Wed. | 23 | 1 | 9 | 12 | 26 | 4 | 10 | 26 | 15 Mar. (74) | 2 Mon. | 315 | .945 | 63 | 148 | 254 | 4267 |
| 24 Mar. (83) | 5 Thur. | 38 | 32 | 15 | 25 | 41 | 36 | 16 | 38 | 4 Mar. (63) | 6 Fri. | 74 | .222 | 9938 | 995 | 223 | 4268 |

† See footnote p. liii above.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| Kali. | Saka. | Chaitrâdi Vikrama. | Mêshâdi (Solar) year in Bengal. | Kollam. | A. D. | Luni-Solar cycle. (Southern.) | Brihaspati cycle (Northern) current at Mesha saṅkrânti. | Name of month. | Time of the preceding saṅkrânti expressed in Lunation parts (t.) | Time of the preceding saṅkrânti expressed in Tithis. | Time of the succeeding saṅkrânti expressed in Lunation parts (t.) | Time of the succeeding saṅkrânti expressed in Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4269 | 1090 | 1225 | 574 | 342-43 | 1167-68 | 21 Sarvajit . . . . | 25 Khara | | . . . . . | . . . . . | . . . . . | . . . . . |
| 4270 | 1091 | 1226 | 575 | 343-44 | *1168-69 | 22 Sarvadhârin . . | 26 Nandana . . . . . | | . . . . . | . . . . . | . . . . . | . . . . . |
| 4271 | 1092 | 1227 | 576 | 344-45 | 1169-70 | 23 Virodhin . . | 27 Vijaya . | 5 Śrâvaṇa . . . | 9993 | 29.979 | 803 | 2.409 |
| 4272 | 1093 | 1228 | 577 | 345-46 | 1170-71 | 24 Vikrita . . . | 28 Jaya . | | . . . . . | . . . . . | . . . . . | . . . . . |
| 4273 | 1094 | 1229 | 578 | 346-47 | 1171-72 | 25 Khara . . . . | 29 Manmatha . . | | . . . . . | . . . . . | . . . . . | . . . . . |
| 4274 | 1095 | 1230 | 579 | 347-48 | *1172-73 | 26 Nandana . . . . . | 30 Durmukha. | 3 Jyeshṭha | 9787 | 29.361 | 334 | 1.002 |
| 4275 | 1096 | 1231 | 580 | 348-49 | 1173-74 | 27 Vijaya . . . . . | 31 Hemalamba , | | . . . . . | . . . . . | . . . . . | . . . . . |
| 4276 | 1097 | 1232 | 581 | 349-50 | 1174-75 | 28 Jaya . . . . . . . . | 32 Vilamba | | . . . . . | . . . . . | . . . . . | . . . . . |
| 4277 | 1098 | 1233 | 582 | 350-51 | 1175-76 | 29 Manmatha . . | 33 Vikârin . . | 1 Chaitra . | 9959 | 29.877 | 324 | 0.972 |
| 4278 | 1099 | 1234 | 583 | 351-52 | *1176-77 | 30 Durmukha . . . | 34 Sârvari | | . . . . . | . . . . . | . . . . . | . . . . . |
| 4279 | 1100 | 1235 | 584 | 352-53 | 1177-78 | 31 Hemalamba . . | 35 Plava | 5 Śrâvaṇa | 9538 | 28.614 | 342 | 1.026 |
| 4280 | 1101 | 1236 | 585 | 353-54 | 1178-79 | 32 Vilamba . . . . | 36 Śubhakrit . . . | | . . . . . | . . . . . | . . . . . | . . . . . |
| 4281 | 1102 | 1237 | 586 | 354-55 | 1179-80 | 33 Vikârin . . . . . | 37 Śobhana . | | . . . . . | . . . . . | . . . . . | . . . . . |
| 4282 | 1103 | 1238 | 587 | 355-56 | *1180-81 | 34 Sârvari . . . | 38 Krodhin . | 4 Âshâḍha . . . . | 9802 | 29.406 | 487 | 1.461 |
| 4283 | 1104 | 1239 | 588 | 356-57 | 1181-82 | 35 Plava . . . . . . | 39 Viśvâvasu | | . . . . . | . . . . . | . . . . . | . . . . . |
| 4284 | 1105 | 1240 | 589 | 357-58 | 1182-83 | 36 Śubhakrit . . | 40 Parâbhava | | . . . . . | . . . . . | . . . . . | . . . . . |
| 4285 | 1106 | 1241 | 590 | 358-59 | 1183-84 | 37 Śobhana . . . . | 41 Plavaṅga . | 2 Vaiśâkha . . | 9866 | 29.598 | 414 | 1.242 |
| 4286 | 1107 | 1242 | 591 | 359-60 | *1184-85 | 38 Krodhin . . . . . | 42 Kîlaka . | | . . . . . | . . . . . | . . . . . | . . . . . |
| 4287 | 1108 | 1243 | 592 | 360-61 | 1185-86 | 39 Viśvâvasu . . . | 43 Saumya . . | 6 Bhâdrapada . | 9875 | 29.625 | 414 | 1.242 |
| 4288 | 1109 | 1244 | 593 | 361-62 | 1186-87 | 40 Parâbhava . . . . | 44 Sâdhâraṇa . . | | . . . . . | . . . . . | . . . . . | . . . . . |
| 4289 | 1110 | 1245 | 594 | 362-63 | 1187-88 | 41 Plavaṅga . . . . | 45 Virodhakrit . | | . . . . . | . . . . . | . . . . . | . . . . . |
| 4290 | 1111 | 1246 | 595 | 363-64 | *1188-89 | 42 Kîlaka . . . . . . | 46 Paridhâvin | 5 Śrâvaṇa . . . | 9997 | 29.991 | 760 | 2.280 |
| 4291 | 1112 | 1247 | 596 | 364-65 | 1189-90 | 43 Saumya . . . . | 47 Pramâdin . . | | . . . . . | . . . . . | . . . . . | . . . . . |
| 4292 | 1113 | 1248 | 597 | 365-66 | 1190-91 | 44 Sâdhâraṇa . . . | 48 Ânanda . . . | | . . . . . | . . . . . | . . . . . | . . . . . |
| 4293 | 1114 | 1249 | 598 | 366-67 | 1191-92 | 45 Virodhakrit | 49 Râkshasa . . | 3 Jyeshṭha . . . | 9924 | 29.772 | 530 | 1.590 |
| 4294 | 1115 | 1250 | 599 | 367-68 | *1192-93 | 46 Paridhâvin . . | 50 Anala . | | . . . . . | . . . . . | . . . . . | . . . . . |
| 4295 | 1116 | 1251 | 600 | 368-69 | 1193-94 | 47 Pramâdin . | 51 Piṅgala . . | 7 Âśvina . . .<br>10 *Pausha Ksh.* | 9906<br>82 | 29.718<br>0.246 | 145<br>9941 | 0.435<br>29.823 |
| 4296 | 1117 | 1252 | 601 | 369-70 | 1194-95 | 48 Ânanda . . . . | 52 Kâlayukta | 1 Chaitra . . . . . | 9951 | 29.853 | 282 | 0.846 |
| 4297 | 1118 | 1253 | 602 | 370-71 | 1195-96 | 49 Râkshasa . . . . | 53 Siddhârthin | | . . . . . | . . . . . | . . . . . | . . . . . |
| 4298 | 1119 | 1254 | 603 | 371-72 | *1196-97 | 50 Anala . . . . . . . | 54 Raudra . . . | 5 Śrâvaṇa . . . | 9518 | 28.554 | 314 | 0.942 |
| 4299 | 1120 | 1255 | 604 | 372-73 | 1197-98 | 51 Piṅgala . . . | 55 Durmati . . . . . | | . . . . . | . . . . . | . . . . . | . . . . . |
| 4300 | 1121 | 1256 | 605 | 373-74 | 1198-99 | 52 Kâlayukta . . | 56 Dundubhi . | | . . . . . | . . . . . | . . . . . | . . . . . |

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

| III. COMMENCEMENT OF THE | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Solar year. | | | | | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | Kali. |
| Day and Month. A. D. | (Time of the Mesha saṁkrânti.) | | | | | | | | | Day and Month. A. D. | Week day. | At Sunrise on meridian of Ujjain. | | | | | |
| | Week day. | By the Ârya Siddhânta. | | | | By the Sûrya Siddhânta. | | | | | | Moon's Age. | | | | | |
| | | Gh. | Pa. | H. | M. | Gh. | Pa. | H. | M. | | | Lunar parts elapsed. (t.) | Tithis elapsed. | a. | b. | c. | |
| 13 | 14 | 15 | | 17 | | 15a | | 17a | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 24 Mar. (83).. | 6 Fri..... | 54 | 4 | 21 | 37 | 57 | 7 | 22 | 51 | 23 Mar. (82).. | 5 Thur... | 54 | .162 | 9973 | 931 | 274 | 4269 |
| 24 Mar. (84).. | 1 Sun.... | 9 | 35 | 3 | 50 | 12 | 39 | 5 | 3 | 12 Mar. (72).. | 3 Tues.... | 198 | .594 | 187 | 814 | 240 | 4270 |
| 24 Mar. (83).. | 2 Mon.... | 25 | 6 | 10 | 2 | 28 | 10 | 11 | 16 | 1 Mar. (60).. | 0 Sat. .... | 85 | .255 | 63 | 682 | 215 | 4271 |
| 24 Mar. (83).. | 3 Tues.... | 40 | 37 | 16 | 15 | 43 | 42 | 17 | 29 | 20 Mar. (79).. | 6 Fri..... | 157 | .471 | 99 | 598 | 267 | 4272 |
| 24 Mar. (83).. | 4 Wed... | 56 | 9 | 22 | 27 | 59 | 13 | 23 | 41 | 9 Mar. (68).. | 3 Tues.... | 161 | .483 | 9973 | 445 | 230 | 4273 |
| 24 Mar. (84).. | 6 Fri.... | 11 | 40 | 4 | 40 | 14 | 45 | 5 | 54 | 26 Feb. (57).. | 0 Sat..... | 127 | .381 | 9849 | 292 | 205 | 4274 |
| 24 Mar. (83).. | 0 Sat..... | 27 | 11 | 10 | 52 | 30 | 16 | 12 | 6 | 16 Mar. (75).. | 6 Fri..... | 163 | .489 | 9864 | 225 | 256 | 4275 |
| 24 Mar. (83).. | 1 Sun.... | 42 | 42 | 17 | 5 | 45 | 48 | 18 | 19 | 6 Mar. (65).. | 4 Wed.... | 329 | .987 | 98 | 112 | 226 | 4276 |
| 24 Mar. (83).. | 2 Mon.... | 58 | 14 | 23 | 17 | †1 | 19 | †0 | 32 | 23 Feb. (54).. | 1 Sun.... | 81 | .243 | 9974 | 959 | 197 | 4277 |
| 24 Mar. (84).. | 4 Wed.... | 13 | 45 | 5 | 30 | 16 | 51 | 6 | 44 | 13 Mar. (73).. | 0 Sat..... | 61 | .183 | 8 | 895 | 249 | 4278 |
| 24 Mar. (83).. | 5 Thur... | 29 | 16 | 11 | 42 | 32 | 22 | 12 | 57 | 3 Mar. (62).. | 5 Thur... | 227 | .681 | 223 | 778 | 221 | 4279 |
| 24 Mar. (83).. | 6 Fri..... | 44 | 47 | 17 | 55 | 47 | 54 | 19 | 10 | 22 Mar. (81).. | 4 Wed.... | 261 | .783 | 257 | 714 | 272 | 4280 |
| 25 Mar. (84).. | 1 Sun.... | 0 | 19 | 0 | 7 | 3 | 25 | 1 | 22 | 11 Mar. (70).. | 1 Sun.... | 220 | .660 | 133 | 561 | 241 | 4281 |
| 24 Mar. (84).. | 2 Mon.... | 15 | 50 | 6 | 20 | 18 | 57 | 7 | 35 | 28 Feb. (59).. | 5 Thur... | 227 | .681 | 9 | 409 | 210 | 4282 |
| 24 Mar. (83).. | 3 Tues.... | 31 | 21 | 12 | 32 | 34 | 28 | 13 | 47 | 18 Mar. (77).. | 4 Wed.... | 299 | .897 | 43 | 345 | 262 | 4283 |
| 24 Mar. (83).. | 4 Wed.... | 46 | 52 | 18 | 45 | 50 | 0 | 20 | 0 | 7 Mar. (66).. | 1 Sun.... | 190 | .570 | 9919 | 192 | 231 | 4284 |
| 25 Mar. (84).. | 6 Fri..... | 2 | 24 | 0 | 57 | 5 | 31 | 2 | 13 | 24 Feb. (55).. | 5 Thur... | ⊙—3 | —.009 | 9795 | 39 | 200 | 4285 |
| 24 Mar. (84).. | 0 Sat..... | 17 | 55 | 7 | 10 | 21 | 3 | 8 | 25 | 15 Mar. (75).. | 5 Thur... | 318 | .954 | 165 | 11 | 254 | 4286 |
| 24 Mar. (83).. | 1 Sun.... | 33 | 26 | 13 | 22 | 36 | 35 | 14 | 38 | 4 Mar. (63).. | 2 Mon.... | 76 | .228 | 44 | 855 | 225 | 4287 |
| 24 Mar. (83).. | 2 Mon.... | 48 | 57 | 19 | 35 | 52 | 6 | 20 | 50 | 23 Mar. (82).. | 1 Sun.... | 84 | .252 | 79 | 796 | 274 | 4288 |
| 25 Mar. (84).. | 4 Wed.... | 4 | 29 | 1 | 47 | 7 | 38 | 3 | 3 | 13 Mar. (72).. | 6 Fri..... | 307 | .921 | 293 | 678 | 246 | 4289 |
| 24 Mar. (84).. | 5 Thur... | 20 | 0 | 8 | 0 | 23 | 9 | 9 | 16 | 1 Mar. (61).. | 3 Tues.... | 289 | .867 | 169 | 525 | 215 | 4290 |
| 24 Mar. (83).. | 6 Fri..... | 35 | 31 | 14 | 12 | 38 | 41 | 15 | 28 | 19 Mar. (78).. | 1 Sun.... | 69 | .207 | 9865 | 425 | 264 | 4291 |
| 24 Mar. (83).. | 0 Sat..... | 51 | 2 | 20 | 25 | 54 | 12 | 21 | 41 | 8 Mar. (67).. | 5 Thur... | 19 | .057 | 9740 | 272 | 233 | 4292 |
| 25 Mar. (84).. | 2 Mon.... | 6 | 34 | 2 | 37 | 9 | 44 | 3 | 53 | 26 Feb. (57).. | 3 Tues.... | 210 | .630 | 9955 | 156 | 205 | 4293 |
| 24 Mar. (84).. | 3 Tues.... | 22 | 5 | 8 | 50 | 25 | 15 | 10 | 6 | 16 Mar. (76).. | 2 Mon.... | 206 | .618 | 9959 | 92 | 256 | 4294 |
| 24 Mar. (83).. | 4 Wed.... | 37 | 36 | 15 | 2 | 40 | 47 | 16 | 19 | 6 Mar. (65).. | 0 Sat..... | 322 | .966 | 204 | 975 | 228 | 4295 |
| 24 Mar. (83).. | 5 Thur... | 53 | 7 | 21 | 15 | 56 | 18 | 22 | 31 | 23 Feb. (54).. | 4 Wed.... | 96 | .288 | 79 | 822 | 198 | 4296 |
| 25 Mar. (84).. | 0 Sat..... | 8 | 39 | 3 | 27 | 11 | 50 | 4 | 44 | 14 Mar. (73).. | 3 Tues.... | 114 | .342 | 114 | 758 | 249 | 4297 |
| 24 Mar. (84).. | 1 Sun.... | 24 | 10 | 9 | 40 | 27 | 21 | 10 | 57 | 2 Mar. (62).. | 0 Sat..... | 44 | .132 | 9990 | 606 | 218 | 4298 |
| 24 Mar. (83).. | 2 Mon.... | 39 | 41 | 15 | 52 | 42 | 53 | 17 | 9 | 21 Mar. (80).. | 6 Fri..... | 128 | .384 | 24 | 541 | 269 | 4299 |
| 24 Mar. (83).. | 3 Tues.... | 55 | 12 | 22 | 5 | 58 | 24 | 23 | 22 | 10 Mar. (69).. | 3 Tues.... | 131 | .393 | 9900 | 389 | 239 | 4300 |

† See footnote p. liii above. ⊙ See Text, Art. 101 above, para. 2

## TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR | | | | | | | | II. ADDED LUNAR MONTHS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True | | | | |
| Kali. | Saka. | Chaitrâdi Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | Luni-Solar cycle. (Southern.) | Bṛihaspati cycle (Northern) current at Mesha saṅkrânti. | Name of month. | Time of the preceding saṅkrânti expressed in: Lunation parts. (t.) | Tithis. | Time of the succeeding saṅkrânti expressed in: Lunation parts. (t.) | Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4301 | 1122 | 1257 | 606 | 374- 75 | 1199-200 | 53 Siddhârthin | 57 Rudhirodgârin | 4 Âshâḍha | 9999 | 29.997 | 623 | 1.869 |
| 4302 | 1123 | 1258 | 607 | 375- 76 | *1200- 1 | 54 Raudra | 58 Raktâksha | | | | | |
| 4303 | 1124 | 1259 | 608 | 376- 77 | 1201- 2 | 55 Durmati | 59 Krodhana | | | | | |
| 4304 | 1125 | 1260 | 609 | 377- 78 | 1202- 3 | 56 Dundubhi | 60 Kshaya | 2 Vaiśâkha | 9826 | 29.478 | 422 | 1.266 |
| 4305 | 1126 | 1261 | 610 | 378- 79 | 1203- 4 | 57 Rudhirodgârin | 1 Prabhava | | | | | |
| 4306 | 1127 | 1262 | 611 | 379- 80 | *1204- 5 | 58 Raktâksha | 2 Vibhava | 6 Bhâdrapada | 9854 | 29.562 | 466 | 1.398 |
| 4307 | 1128 | 1263 | 612 | 380- 81 | 1205- 6 | 59 Krodhana | 3 Śukla | | | | | |
| 4308 | 1129 | 1264 | 613 | 381- 82 | 1206- 7 | 60 Kshaya | 4 Pramoda | | | | | |
| 4309 | 1130 | 1265 | 614 | 382- 83 | 1207- 8 | 1 Prabhava | 5 Prajâpati | 4 Âshâḍha | 9462 | 28.386 | 100 | 0.300 |
| 4310 | 1131 | 1266 | 615 | 383- 84 | *1208- 9 | 2 Vibhava | 6 Aṅgiras | | | | | |
| 4311 | 1132 | 1267 | 616 | 384- 85 | 1209- 10 | 3 Śukla | 7 Śrîmukha | | | | | |
| 4312 | 1133 | 1268 | 617 | 385- 86 | 1210- 11 | 4 Pramoda | 8 Bhâva | 3 Jyeshṭha | 9960 | 29.880 | 667 | 2.001 |
| 4313 | 1134 | 1269 | 618 | 386- 87 | 1211- 12 | 5 Prajâpati | 9 Yuvan | | | | | |
| 4314 | 1135 | 1270 | 619 | 387- 88 | *1212- 13 | 6 Aṅgiras | 10 Dhâtṛi | 7 Âśvina | 9991 | 29.973 | 304 | 0.912 |
| 4315 | 1136 | 1271 | 620 | 388- 89 | 1213- 14 | 7 Śrîmukha | 11 Îśvara | | | | | |
| 4316 | 1137 | 1272 | 621 | 389- 90 | 1214- 15 | 8 Bhâva | 12 Bahudhânya | | | | | |
| 4317 | 1138 | 1273 | 622 | 390- 91 | 1215- 16 | 9 Yuvan | 13 Pramâthin | 5 Śrâvaṇa | 9588 | 28.764 | 284 | 0.852 |
| 4318 | 1139 | 1274 | 623 | 391- 92 | *1216- 17 | 10 Dhâtṛi | 14 Vikrama | | | | | |
| 4319 | 1140 | 1275 | 624 | 392- 93 | 1217- 18 | 11 Îśvara | 15 Vṛisha | | | | | |
| 4320 | 1141 | 1276 | 625 | 393- 94 | 1218- 19 | 12 Bahudhânya | 16 Chitrabhânu | 3 Jyeshṭha | 9500 | 28.500 | 162 | 0.486 |
| 4321 | 1142 | 1277 | 626 | 394- 95 | 1219- 20 | 13 Pramâthin | 17 Subhânu | | | | | |
| 4322 | 1143 | 1278 | 627 | 395- 96 | *1220- 21 | 14 Vikrama | 18 Târaṇa | | | | | |
| 4323 | 1144 | 1279 | 628 | 396- 97 | 1221- 22 | 15 Vṛisha | 19 Pârthiva | 2 Vaiśâkha | 9816 | 29.448 | 380 | 1.140 |
| 4324 | 1145 | 1280 | 629 | 397- 98 | 1222- 23 | 16 Chitrabhânu | 20 Vyaya | | | | | |
| 4325 | 1146 | 1281 | 630 | 398- 99 | 1223- 24 | 17 Subhânu | 21 Sarvajit | 6 Bhâdrapada | 9814 | 29.442 | 435 | 1.305 |
| 4326 | 1147 | 1282 | 631 | 399-400 | *1224- 25 | 18 Târaṇa | 22 Sarvadhârin | | | | | |
| 4327 | 1148 | 1283 | 632 | 400- 1 | 1225- 26 | 19 Pârthiva | 23 Virodhin | | | | | |
| 4328 | 1149 | 1284 | 633 | 401- 2 | 1226- 27 | 20 Vyaya | 24 Vikṛita | 4 Âshâḍha | 9648 | 28.944 | 281 | 0.843 |
| 4329 | 1150 | 1285 | 634 | 402- 3 | 1227- 28 | 21 Sarvajit | 25 Khara | | | | | |
| 4330 | 1151 | 1286 | 635 | 403- 4 | *1228- 29 | 22 Sarvadhârin | 26 Nandana | | | | | |
| 4331 | 1152 | 1287 | 636 | 404- 5 | 1229- 30 | 23 Virodhin | 27 Vijaya | 3 Jyeshṭha | 9925 | 29.775 | 705 | 2.115 |
| 4332 | 1153 | 1288 | 637 | 405- 6 | 1230- 31 | 24 Vikṛita | 28 Jaya | | | | | |
| 4333 | 1154 | 1289 | 638 | 406- 7 | 1231- 32 | 25 Khara | 29 Manmatha | 7 Âśvina | 9984 | 29.952 | 364 | 1.092 |

# TABLE I.

(Col. 23) $a$ = Distance of moon from sun. (Col. 24) $b$ = moon's mean anomaly. (Col. 25) $c$ = sun's mean anomaly.

III. COMMENCEMENT OF THE

| Solar year. | | | | | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | | Kali. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Day and Month A. D. | (Time of the Mesha saṅkrânti.) | | | | | | | | | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain | | | | | | |
| | Week day. | By the Ârya Siddhânta | | | | By the Sûrya Siddhânta | | | | | | Moon's Age | | | | | | |
| | | Gh. | Pa. | H. | M. | Gh. | Pa. | H. | M. | | | Lunar parts elapsed. (t) | Tithis elapsed. | a. | b. | c. | | |
| 13 | 14 | 15 | | 17 | | 15a | | 17a | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | | 1 |
| 25 Mar. (84) | 5 Thur. | 10 | 44 | 4 | 17 | 13 | 56 | 5 | 34 | 27 Feb. (58) | 0 Sat. | 58 | .174 | 9776 | 236 | 208 | | 4301 |
| 24 Mar. (84) | 6 Fri. | 26 | 15 | 10 | 30 | 29 | 27 | 11 | 47 | 17 Mar. (77) | 6 Fri. | 74 | .222 | 9810 | 172 | 259 | | 4302 |
| 24 Mar. (83) | 0 Sat. | 41 | 46 | 16 | 42 | 44 | 59 | 18 | 0 | 7 Mar. (66) | 4 Wed. | 213 | .639 | 25 | 55 | 231 | | 4303 |
| 24 Mar. (83) | 1 Sun. | 57 | 17 | 22 | 55 | †0 | 30 | †0 | 12 | 25 Feb. (56) | 2 Mon. | 329 | .987 | 239 | 939 | 203 | | 4304 |
| 25 Mar. (84) | 3 Tues. | 12 | 49 | 5 | 7 | 16 | 2 | 6 | 25 | 16 Mar. (75) | 1 Sun. | 315 | .945 | 274 | 875 | 254 | | 4305 |
| 25 Mar. (84) | 4 Wed. | 28 | 20 | 11 | 20 | 31 | 33 | 12 | 37 | 4 Mar. (64) | 5 Thur. | 153 | .459 | 149 | 722 | 223 | | 4306 |
| 24 Mar. (83) | 5 Thur. | 43 | 51 | 17 | 32 | 47 | 5 | 18 | 50 | 23 Mar. (82) | 4 Wed. | 205 | .615 | 184 | 658 | 275 | | 4307 |
| 24 Mar. (83) | 6 Fri. | 59 | 22 | 23 | 45 | †2 | 36 | †1 | 3 | 12 Mar. (71) | 1 Sun. | 196 | .588 | 60 | 505 | 244 | | 4308 |
| 25 Mar. (84) | 1 Sun. | 14 | 54 | 5 | 57 | 18 | 6 | 7 | 15 | 1 Mar. (60) | 5 Thur. | 189 | .567 | 9935 | 352 | 213 | | 4309 |
| 24 Mar. (84) | 2 Mon. | 30 | 25 | 12 | 10 | 33 | 40 | 13 | 28 | 19 Mar. (79) | 4 Wed. | 246 | .738 | 9970 | 288 | 264 | | 4310 |
| 24 Mar. (83) | 3 Tues. | 45 | 56 | 18 | 22 | 49 | 10 | 19 | 40 | 8 Mar. (67) | 1 Sun. | 92 | .276 | 9846 | 136 | 233 | | 4311 |
| 25 Mar. (84) | 5 Thur. | 1 | 27 | 0 | 35 | 4 | 43 | 1 | 53 | 26 Feb. (57) | 6 Fri. | 220 | .660 | 60 | 19 | 205 | | 4312 |
| 25 Mar. (84) | 6 Fri. | 16 | 59 | 6 | 47 | 20 | 14 | 8 | 6 | 17 Mar. (76) | 5 Thur. | 195 | .585 | 95 | 955 | 257 | | 4313 |
| 24 Mar. (84) | 0 Sat. | 32 | 30 | 13 | 0 | 35 | 46 | 14 | 18 | 6 Mar. (65) | 3 Tues. | 330 | .990 | 309 | 830 | 226 | | 4314 |
| 24 Mar. (83) | 1 Sun. | 48 | 1 | 19 | 12 | 51 | 17 | 20 | 31 | 24 Mar. (83) | 1 Sun. | 6 | .018 | 5 | 738 | 277 | | 4315 |
| 25 Mar. (84) | 3 Tues. | 3 | 32 | 1 | 25 | 6 | 49 | 2 | 43 | 14 Mar. (73) | 6 Fri. | 263 | .789 | 220 | 622 | 249 | | 4316 |
| 25 Mar. (84) | 4 Wed. | 19 | 4 | 7 | 37 | 22 | 20 | 8 | 56 | 3 Mar. (62) | 3 Tues. | 260 | .780 | 95 | 469 | 218 | | 4317 |
| 24 Mar. (84) | 5 Thur. | 34 | 35 | 13 | 50 | 37 | 52 | 15 | 9 | 20 Mar. (80) | 1 Sun. | 34 | .102 | 9791 | 369 | 267 | | 4318 |
| 24 Mar. (83) | 6 Fri. | 50 | 6 | 20 | 2 | 53 | 23 | 21 | 21 | 10 Mar. (69) | 6 Fri. | 286 | .858 | 6 | 252 | 239 | | 4319 |
| 25 Mar. (84) | 1 Sun. | 5 | 37 | 2 | 15 | 8 | 55 | 3 | 34 | 27 Feb. (58) | 3 Tues. | 106 | .318 | 9881 | 99 | 208 | | 4320 |
| 25 Mar. (84) | 2 Mon. | 21 | 9 | 8 | 27 | 24 | 26 | 9 | 46 | 18 Mar. (77) | 2 Mon. | 86 | .258 | 9916 | 35 | 259 | | 4321 |
| 24 Mar. (84) | 3 Tues. | 36 | 40 | 14 | 40 | 39 | 58 | 15 | 59 | 7 Mar. (67) | 0 Sat. | 201 | .603 | 130 | 919 | 231 | | 4322 |
| 24 Mar. (83) | 4 Wed. | 52 | 11 | 20 | 52 | 55 | 29 | 22 | 12 | 24 Feb. (55) | 4 Wed. | 10 | .030 | 6 | 766 | 200 | | 4323 |
| 25 Mar. (84) | 6 Fri. | 7 | 42 | 3 | 5 | 11 | 1 | 4 | 24 | 15 Mar. (74) | 3 Tues. | 47 | .141 | 41 | 702 | 252 | | 4324 |
| 25 Mar. (84) | 0 Sat. | 23 | 14 | 9 | 17 | 26 | 32 | 10 | 37 | 4 Mar. (63) | 0 Sat. | 14 | .042 | 9916 | 549 | 221 | | 4325 |
| 24 Mar. (84) | 1 Sun. | 38 | 45 | 15 | 30 | 42 | 4 | 16 | 50 | 22 Mar. (82) | 6 Fri. | 104 | .312 | 9951 | 485 | 272 | | 4326 |
| 24 Mar. (83) | 2 Mon. | 54 | 16 | 21 | 42 | 57 | 35 | 23 | 2 | 11 Mar. (70) | 3 Tues. | 89 | .267 | 9827 | 332 | 241 | | 4327 |
| 25 Mar. (84) | 4 Wed. | 9 | 47 | 3 | 55 | 13 | 7 | 5 | 15 | 1 Mar. (60) | 1 Sun. | 320 | .960 | 41 | 216 | 213 | | 4328 |
| 25 Mar. (84) | 5 Thur. | 25 | 19 | 10 | 7 | 28 | 38 | 11 | 27 | 20 Mar. (79) | 0 Sat. | 330 | .990 | 76 | 152 | 264 | | 4329 |
| 24 Mar. (84) | 6 Fri. | 40 | 50 | 16 | 20 | 44 | 10 | 17 | 40 | 8 Mar. (68) | 4 Wed. | 91 | .273 | 9951 | 999 | 234 | | 4330 |
| 24 Mar. (83) | 0 Sat. | 56 | 21 | 22 | 32 | 59 | 42 | 23 | 53 | 26 Feb. (57) | 2 Mon. | 214 | .642 | 166 | 853 | 203 | | 4331 |
| 25 Mar. (84) | 2 Mon. | 11 | 52 | 4 | 45 | 15 | 13 | 6 | 5 | 17 Mar. (76) | 1 Sun. | 213 | .639 | 200 | 819 | 257 | | 4332 |
| 25 Mar. (84) | 3 Tues. | 27 | 24 | 10 | 57 | 30 | 45 | 12 | 18 | 6 Mar. (65) | 5 Thur. | 95 | .285 | 76 | 666 | 226 | | 4333 |

† See footnote p. liii above.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR | | | | | | | | II. ADDED LUNAR MONTHS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara | | True. | | | | |
| Kali | Saka | Chaitrâdi Vikrama | Meshâdi (Solar) year in Bengal | Kollam | A. D. | Luni-Solar cycle. (Southern) | Bṛihaspati cycle (Northern) current at Mesha saṅkrânti | Name of month. | Time of the preceding saṅkrânti expressed in: Lunation parts (l.) | Time of the preceding saṅkrânti expressed in: Tithis. | Time of the succeeding saṅkrânti expressed in: Lunation parts (l.) | Time of the succeeding saṅkrânti expressed in: Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4334 | 1155 | 1290 | 639 | 407- 8 | *1232-33 | 26 Nandana | 30 Durmukha | | | | | |
| 4335 | 1156 | 1291 | 640 | 408- 9 | 1233-34 | 27 Vijaya | 31 Hemalamba | | | | | |
| 4336 | 1157 | 1292 | 641 | 409-10 | 1234-35 | 28 Jaya | 32 Vilamba | 5 Śrâvaṇa | 9746 | 29.238 | 349 | 1.047 |
| 4337 | 1158 | 1293 | 642 | 410-11 | 1235-36 | 29 Manmatha | 33 Vikârin | | | | | |
| 4338 | 1159 | 1294 | 643 | 411-12 | *1236-37 | 30 Durmukha | 34 Śârvari | | | | | |
| 4339 | 1160 | 1295 | 644 | 412-13 | 1237-38 | 31 Hemalamba | 35 Plava | 3 Jyeshṭha | 9473 | 28.419 | 237 | 0.711 |
| 4340 | 1161 | 1296 | 645 | 413-14 | 1238-39 | 32 Vilamba | 36 Śubhakṛit | | | | | |
| 4341 | 1162 | 1297 | 646 | 414-15 | 1239-40 | 33 Vikârin | 37 Śobhana | | | | | |
| 4342 | 1163 | 1298 | 647 | 415-16 | *1240-41 | 34 Śârvari | 38 Krodhin | 2 Vaiśâkha | 9892 | 29.676 | 377 | 1.131 |
| 4343 | 1164 | 1299 | 648 | 416-17 | 1241-42 | 35 Plava | 39 Viśvâvasu | | | | | |
| 4344 | 1165 | 1300 | 649 | 417-18 | 1242-43 | 36 Śubhakṛit | 40 Parâbhava | 6 Bhâdrapada | 9848 | 29.544 | 406 | 1.218 |
| 4345 | 1166 | 1301 | 650 | 418-19 | 1243-44 | 37 Śobhana | 41 Plavaṅga | | | | | |
| 4346 | 1167 | 1302 | 651 | 419-20 | *1244-45 | 38 Krodhin | 42 Kîlaka | | | | | |
| 4347 | 1168 | 1303 | 652 | 420-21 | 1245-46 | 39 Viśvâvasu | 43 Saumya | 4 Âshâḍha | 9755 | 29.265 | 471 | 1.413 |
| 4348 | 1169 | 1304 | 653 | 421-22 | 1246-47 | 40 Parâbhava | 44 Sâdhâraṇa | | | | | |
| 4349 | 1170 | 1305 | 654 | 422-23 | 1247-48 | 41 Plavaṅga | 45 Virodhakṛit | | | | | |
| 4350 | 1171 | 1306 | 655 | 423-24 | *1248-49 | 42 Kîlaka | 46 Paridhâvin | 3 Jyeshṭha | 9900 | 29.700 | 670 | 2.010 |
| 4351 | 1172 | 1307 | 656 | 424-25 | 1249-50 | 43 Saumya | 47 Pramâdin | | | | | |
| 4352 | 1173 | 1308 | 657 | 425-26 | 1250-51 | 44 Sâdhâraṇa | 48 Ânanda [1] | 7 Âśvina | 9943 | 29.829 | 342 | 1.026 |
| 4353 | 1174 | 1309 | 658 | 426-27 | 1251-52 | 45 Virodhakṛit | 50 Anala | | | | | |
| 4354 | 1175 | 1310 | 659 | 427-28 | *1252-53 | 46 Paridhâvin | 51 Piṅgala | | | | | |
| 4355 | 1176 | 1311 | 660 | 428-29 | 1253-54 | 47 Pramâdin | 52 Kâlayukta | 5 Śrâvaṇa | 9945 | 29.835 | 510 | 1.530 |
| 4356 | 1177 | 1312 | 661 | 429-30 | 1254-55 | 48 Ânanda | 53 Siddhârthin | | | | | |
| 4357 | 1178 | 1313 | 662 | 430-31 | 1255-56 | 49 Râkshasa | 54 Raudra | | | | | |
| 4358 | 1179 | 1314 | 663 | 431-32 | *1256-57 | 50 Anala | 55 Durmati | 3 Jyeshṭha | 9434 | 28.302 | 218 | 0.654 |
| 4359 | 1180 | 1315 | 664 | 432-33 | 1257-58 | 51 Piṅgala | 56 Dundubhi | | | | | |
| 4360 | 1181 | 1316 | 665 | 433-34 | 1258-59 | 52 Kâlayukta | 57 Rudhirodgârin | 8 Kârttika<br>10 Pausha (Kshaya) | 9886<br>35 | 29.658<br>0.105 | 51<br>9930 | 0.153<br>29.790 |
| 4361 | 1182 | 1317 | 666 | 434-35 | 1259-60 | 53 Siddhârthin | 58 Raktâksha | 1 Chaitra | 9876 | 29.628 | 65 | 0.195 |
| 4362 | 1183 | 1318 | 667 | 435-36 | *1260-61 | 54 Raudra | 59 Krodhana | | | | | |
| 4363 | 1184 | 1319 | 668 | 436-37 | 1261-62 | 55 Durmati | 60 Kshaya | 6 Bhâdrapada | 9981 | 29.943 | 447 | 1.341 |
| 4364 | 1185 | 1320 | 669 | 437-38 | 1262-63 | 56 Dundubhi | 1 Prabhava | | | | | |
| 4365 | 1186 | 1321 | 670 | 438-39 | 1263-64 | 57 Rudhirodgârin | 2 Vibhava | | | | | |

[1] Râkshasa, No. 49, was suppressed in the north.

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

III. COMMENCEMENT OF THE

| Solar year | | | | | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | Kali |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Day and Month A. D. | (Time of the Mesha saṅkrânti.) | | | | | | | | | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain | | | | | |
| | Week day. | By the Ârya Siddhânta | | | | By the Sûrya Siddhânta | | | | | | Moon's Age | | a. | b. | c. | |
| | | Gh. | Pa. | H. | M. | Gh. | Pa. | H. | M. | | | Lunar parts elapsed. (t.) | Tithis elapsed. | | | | |
| 13 | 14 | 15 | | 17 | | 15a | | 17a | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 24 Mar. (84) | 4 Wed. | 42 | 55 | 17 | 10 | 46 | 16 | 18 | 30 | 24 Mar. (84) | 4 Wed. | 168 | 504 | 111 | 602 | 277 | 4334 |
| 24 Mar. (83) | 5 Thur. | 56 | 26 | 23 | 22 | †1 | 48 | †0 | 43 | 13 Mar. (72) | 1 Sun. | 172 | 516 | 9987 | 449 | 246 | 4335 |
| 25 Mar. (84) | 0 Sat. | 13 | 57 | 5 | 35 | 17 | 19 | 6 | 56 | 2 Mar. (61) | 5 Thur. | 137 | 411 | 9862 | 296 | 216 | 4336 |
| 25 Mar. (84) | 1 Sun. | 29 | 29 | 11 | 47 | 32 | 51 | 13 | 8 | 21 Mar. (80) | 4 Wed. | 176 | 528 | 9897 | 232 | 267 | 4337 |
| 24 Mar. (84) | 2 Mon. | 45 | 0 | 18 | 0 | 48 | 22 | 19 | 21 | 9 Mar. (69) | 1 Sun. | ⊙ −19 | −.057 | 9773 | 80 | 236 | 4338 |
| 25 Mar. (84) | 4 Wed. | 0 | 31 | 0 | 12 | 3 | 54 | 1 | 33 | 27 Feb. (58) | 6 Fri. | 97 | .291 | 9987 | 963 | 208 | 4339 |
| 25 Mar. (84) | 5 Thur. | 16 | 2 | 6 | 25 | 19 | 25 | 7 | 46 | 18 Mar. (77) | 5 Thur. | 78 | .234 | 22 | 899 | 259 | 4340 |
| 25 Mar. (84) | 6 Fri. | 31 | 34 | 12 | 37 | 34 | 57 | 13 | 59 | 8 Mar. (67) | 3 Tues. | 239 | .717 | 236 | 782 | 231 | 4341 |
| 24 Mar. (84) | 0 Sat. | 47 | 5 | 18 | 50 | 50 | 28 | 20 | 11 | 25 Feb. (56) | 0 Sat. | 153 | 459 | 112 | 630 | 200 | 4342 |
| 25 Mar. (84) | 2 Mon. | 2 | 36 | 1 | 2 | 6 | 0 | 2 | 24 | 15 Mar. (74) | 6 Fri. | 229 | 687 | 146 | 566 | 252 | 4343 |
| 25 Mar. (84) | 3 Tues. | 18 | 7 | 7 | 15 | 21 | 31 | 8 | 37 | 4 Mar. (63) | 3 Tues. | 236 | .708 | 22 | 413 | 221 | 4344 |
| 25 Mar. (84) | 4 Wed. | 33 | 39 | 13 | 27 | 37 | 3 | 14 | 49 | 23 Mar. (82) | 2 Mon. | 311 | 933 | 57 | 349 | 272 | 4345 |
| 24 Mar. (84) | 5 Thur. | 49 | 10 | 19 | 40 | 52 | 34 | 21 | 2 | 11 Mar. (71) | 6 Fri. | 204 | 612 | 9932 | 196 | 241 | 4346 |
| 25 Mar. (84) | 0 Sat. | 4 | 41 | 1 | 52 | 8 | 6 | 3 | 14 | 28 Feb. (59) | 3 Tues. | ⊙ −12 | −.036 | 9808 | 43 | 211 | 4347 |
| 25 Mar. (84) | 1 Sun. | 20 | 12 | 8 | 5 | 23 | 37 | 9 | 27 | 19 Mar. (78) | 2 Mon. | ⊙ −36 | −.109 | 9843 | 979 | 262 | 4348 |
| 25 Mar. (84) | 2 Mon. | 35 | 44 | 14 | 17 | 39 | 9 | 15 | 40 | 9 Mar. (68) | 0 Sat. | 91 | .273 | 57 | 863 | 234 | 4349 |
| 24 Mar. (84) | 3 Tues. | 51 | 15 | 20 | 30 | 54 | 40 | 21 | 52 | 27 Feb. (58) | 5 Thur. | 273 | .819 | 271 | 746 | 206 | 4350 |
| 25 Mar. (84) | 5 Thur. | 6 | 46 | 2 | 42 | 10 | 12 | 4 | 5 | 17 Mar. (76) | 4 Wed. | 318 | .954 | 306 | 682 | 257 | 4351 |
| 25 Mar. (84) | 6 Fri. | 22 | 17 | 8 | 55 | 25 | 44 | 10 | 17 | 6 Mar. (65) | 1 Sun. | 296 | .888 | 182 | 530 | 226 | 4352 |
| 25 Mar. (84) | 0 Sat. | 37 | 49 | 15 | 7 | 41 | 15 | 16 | 30 | 24 Mar. (83) | 6 Fri. | 79 | .237 | 9878 | 429 | 275 | 4353 |
| 24 Mar. (84) | 1 Sun. | 53 | 20 | 21 | 20 | 56 | 47 | 22 | 43 | 12 Mar. (72) | 3 Tues. | 32 | .096 | 9754 | 276 | 244 | 4354 |
| 25 Mar. (84) | 3 Tues. | 8 | 51 | 3 | 32 | 12 | 18 | 4 | 55 | 2 Mar. (61) | 1 Sun. | 227 | .681 | 9968 | 160 | 216 | 4355 |
| 25 Mar. (84) | 4 Wed. | 24 | 22 | 9 | 45 | 27 | 50 | 11 | 8 | 21 Mar. (80) | 0 Sat. | 233 | .699 | 3 | 96 | 267 | 4356 |
| 25 Mar. (84) | 5 Thur. | 39 | 54 | 15 | 57 | 43 | 21 | 17 | 20 | 10 Mar. (69) | 4 Wed. | ⊙ −22 | −.066 | 9878 | 943 | 236 | 4357 |
| 24 Mar. (84) | 6 Fri. | 55 | 25 | 22 | 10 | 58 | 53 | 23 | 33 | 28 Feb. (59) | 2 Mon. | 111 | 333 | 93 | 827 | 208 | 4358 |
| 25 Mar. (84) | 1 Sun. | 10 | 56 | 4 | 22 | 14 | 24 | 5 | 46 | 18 Mar. (77) | 1 Sun. | 127 | .381 | 127 | 763 | 260 | 4359 |
| 25 Mar. (84) | 2 Mon. | 26 | 27 | 10 | 35 | 29 | 56 | 11 | 58 | 7 Mar. (66) | 5 Thur. | 53 | 159 | 3 | 610 | 229 | 4360 |
| 25 Mar. (84) | 3 Tues. | 41 | 59 | 16 | 47 | 45 | 27 | 18 | 11 | 24 Feb. (55) | 2 Mon. | 50 | 150 | 9879 | 457 | 198 | 4361 |
| 24 Mar. (84) | 4 Wed. | 57 | 30 | 23 | 0 | †0 | 59 | †0 | 24 | 14 Mar. (74) | 1 Sun. | 141 | 423 | 9913 | 393 | 249 | 4362 |
| 25 Mar. (84) | 6 Fri. | 13 | 1 | 5 | 12 | 16 | 30 | 6 | 36 | 3 Mar. (62) | 5 Thur. | 70 | .210 | 9789 | 240 | 218 | 4363 |
| 25 Mar. (84) | 0 Sat. | 28 | 32 | 11 | 25 | 32 | 2 | 12 | 49 | 22 Mar. (81) | 4 Wed. | 89 | .267 | 9824 | 176 | 270 | 4364 |
| 25 Mar. (84) | 1 Sun. | 44 | 4 | 17 | 37 | 47 | 33 | 19 | 1 | 12 Mar. (71) | 2 Mon. | 230 | .690 | 38 | 60 | 242 | 4365 |

† See footnote p. liii above. ⊙ See Text Art. 101, para. 2.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| Kali. | Saka. | Chaitrâdi Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | Luni-Solar cycle. (Southern.) | Brihaspati cycle (Northern) current at Mesha sankrânti. | Name of month. | Time of the preceding sankrânti expressed in: Lunation parts (l.) | Tithis. | Time of the succeeding sankrânti expressed in: Lunation parts (l.) | Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4366 | 1187 | 1322 | 671 | 439-40 | *1264-65 | 58 Raktâksha | 3 Śukla | 4 Âshâḍha | 9759 | 29.277 | 582 | 1.746 |
| 4367 | 1188 | 1323 | 672 | 440-41 | 1265-66 | 59 Krodhana | 4 Pramoda | | ..... | ..... | ..... | ..... |
| 4368 | 1189 | 1324 | 673 | 441-42 | 1266-67 | 60 Kshaya | 5 Prajâpati | | ..... | ..... | ..... | ..... |
| 4369 | 1190 | 1325 | 674 | 442-43 | 1267-68 | 1 Prabhava | 6 Angiras | 3 Jyeshṭha | 9958 | 29.874 | 643 | 1.929 |
| 4370 | 1191 | 1326 | 675 | 443-44 | *1268-69 | 2 Vibhava | 7 Śrîmukha | | ..... | ..... | ..... | ..... |
| 4371 | 1192 | 1327 | 676 | 444-45 | 1269-70 | 3 Śukla | 8 Bhâva | 7 Âśvina | 9954 | 29.862 | 306 | 0.918 |
| 4372 | 1193 | 1328 | 677 | 445-46 | 1270-71 | 4 Pramoda | 9 Yuvan | | ..... | ..... | ..... | ..... |
| 4373 | 1194 | 1329 | 678 | 446-47 | 1271-72 | 5 Prajâpati | 10 Dhâtri | | ..... | ..... | ..... | ..... |
| 4374 | 1195 | 1330 | 679 | 447-48 | *1272-73 | 6 Angiras | 11 Îśvara | 4 Âshâḍha | 9301 | 27.903 | 88 | 0.264 |
| 4375 | 1196 | 1331 | 680 | 448-49 | 1273-74 | 7 Śrîmukha | 12 Bahudhânya | | ..... | ..... | ..... | ..... |
| 4376 | 1197 | 1332 | 681 | 449-50 | 1274-75 | 8 Bhâva | 13 Pramâthin | | ..... | ..... | ..... | ..... |
| 4377 | 1198 | 1333 | 682 | 450-51 | 1275-76 | 9 Yuvan | 14 Vikrama | 3 Jyeshṭha | 9460 | 28.380 | 167 | 0.501 |
| 4378 | 1199 | 1334 | 683 | 451-52 | *1276-77 | 10 Dhâtri | 15 Vrisha | | ..... | ..... | ..... | ..... |
| 4379 | 1200 | 1335 | 684 | 452-53 | 1277-78 | 11 Îśvara | 16 Chitrabhânu | 8 Kârttika | 9946 | 29.838 | 25 | 0.075 |
| | | | | | | | | 10 *Pausha (Ksh.)* | 45 | 0.135 | 9982 | 29.946 |
| | | | | | | | | 12 Phâlguna | 9955 | 29.865 | 32 | 0.096 |
| 4380 | 1201 | 1336 | 685 | 453-54 | 1278-79 | 12 Bahudhânya | 17 Subhânu | | ..... | ..... | ..... | ..... |
| 4381 | 1202 | 1337 | 686 | 454-55 | 1279-80 | 13 Pramâthin | 18 Târaṇa | | ..... | ..... | ..... | ..... |
| 4382 | 1203 | 1338 | 687 | 455-56 | *1280-81 | 14 Vikrama | 19 Pârthiva | 5 Śrâvaṇa | 9580 | 28.740 | 174 | 0.522 |
| 4383 | 1204 | 1339 | 688 | 456-57 | 1281-82 | 15 Vrisha | 20 Vyaya | | ..... | ..... | ..... | ..... |
| 4384 | 1205 | 1340 | 689 | 457-58 | 1282-83 | 16 Chitrabhânu | 21 Sarvajit | | ..... | ..... | ..... | ..... |
| 4385 | 1206 | 1341 | 690 | 458-59 | 1283-84 | 17 Subhânu | 22 Sarvadhârin | 4 Âshâḍha | 9721 | 29.163 | 595 | 1.785 |
| 4386 | 1207 | 1342 | 691 | 459-60 | *1284-85 | 18 Târaṇa | 23 Virodhin | | ..... | ..... | ..... | ..... |
| 4387 | 1208 | 1343 | 692 | 460-61 | 1285-86 | 19 Pârthiva | 24 Vikrita | | ..... | ..... | ..... | ..... |
| 4388 | 1209 | 1344 | 693 | 461-62 | 1286-87 | 20 Vyaya | 25 Khara | 2 Vaiśâkha | 9730 | 29.190 | 118 | 0.354 |
| 4389 | 1210 | 1345 | 694 | 462-63 | 1287-88 | 21 Sarvajit | 26 Nandana | | ..... | ..... | ..... | ..... |
| 4390 | 1211 | 1346 | 695 | 463-64 | *1288-89 | 22 Sarvadhârin | 27 Vijaya | 6 Bhâdrapada | 9640 | 28.920 | 63 | 0.189 |
| 4391 | 1212 | 1347 | 696 | 464-65 | 1289-90 | 23 Virodhin | 28 Jaya | | ..... | ..... | ..... | ..... |
| 4392 | 1213 | 1348 | 697 | 465-66 | 1290-91 | 24 Vikrita | 29 Manmatha | | ..... | ..... | ..... | ..... |
| 4393 | 1214 | 1349 | 698 | 466-67 | 1291-92 | 25 Khara | 30 Durmukha | 4 Âshâḍha | 9266 | 27.798 | 133 | 0.399 |
| 4394 | 1215 | 1350 | 699 | 467-68 | *1292-93 | 26 Nandana | 31 Hemalamba | | ..... | ..... | ..... | ..... |
| 4395 | 1216 | 1351 | 700 | 468-69 | 1293-94 | 27 Vijaya | 32 Vilamba | | ..... | ..... | ..... | ..... |
| 4396 | 1217 | 1352 | 701 | 469-70 | 1294-95 | 28 Jaya | 33 Vikârin | 3 Jyeshṭha | 9584 | 28.752 | 202 | 0.606 |

# TABLE I.

(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.

III. COMMENCEMENT OF THE

| Solar year. Day and Month A. D. | Solar year. (Time of the Mesha saṅkrânti.) Week day. | By the Ârya Siddhânta. Gh. | Pa. | H. | M. | By the Sûrya Siddhânta. Gh. | Pa. | H. | M. | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. Moon's Age. Lunar parts elapsed. (t.) | Tithis elapsed. | a. | b. | c. | Kali. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | 14 | 15 | | 17 | | 15a | | 17a | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 24 Mar. (84) | 2 Mon. | 59 | 35 | 23 | 50 | †3 | 5 | †1 | 14 | 29 Feb. (60) | 6 Fri. | ⊙ −[illegible] | −.[illegible] | 9914 | 907 | 211 | 4366 |
| 25 Mar. (84) | 4 Wed. | 15 | 6 | 6 | 2 | 18 | 36 | 7 | 27 | 20 Mar. (79) | 6 Fri. | 330 | .990 | 287 | 879 | 265 | 4367 |
| 25 Mar. (84) | 5 Thur. | 30 | 37 | 12 | 15 | 34 | 8 | 13 | 39 | 9 Mar. (68) | 3 Tues. | 165 | .495 | 168 | 726 | 234 | 4368 |
| 25 Mar. (84) | 6 Fri. | 46 | 9 | 18 | 27 | 49 | 39 | 19 | 52 | 26 Feb. (57) | 0 Sat. | 118 | .354 | 38 | 574 | 203 | 4369 |
| 25 Mar. (85) | 1 Sun. | 1 | 40 | 0 | 40 | 5 | 11 | 2 | 4 | 16 Mar. (76) | 6 Fri. | 204 | .612 | 73 | 510 | 255 | 4370 |
| 25 Mar. (84) | 2 Mon. | 17 | 11 | 6 | 52 | 20 | 42 | 8 | 17 | 5 Mar. (64) | 3 Tues. | 200 | .600 | 9940 | 357 | 224 | 4371 |
| 25 Mar. (84) | 3 Tues. | 32 | 42 | 13 | 5 | 36 | 14 | 14 | 30 | 24 Mar. (83) | 2 Mon. | 259 | .777 | 9983 | 293 | 275 | 4372 |
| 25 Mar. (84) | 4 Wed. | 48 | 14 | 19 | 17 | 51 | 46 | 20 | 42 | 13 Mar. (72) | 6 Fri. | 107 | .321 | 9859 | 140 | 244 | 4373 |
| 25 Mar. (85) | 6 Fri. | 3 | 45 | 1 | 30 | 7 | 17 | 2 | 55 | 2 Mar. (62) | 4 Wed. | 235 | .705 | 73 | 23 | 216 | 4374 |
| 25 Mar. (84) | 0 Sat. | 19 | 16 | 7 | 42 | 22 | 49 | 9 | 7 | 21 Mar. (80) | 3 Tues. | 212 | .636 | 106 | 959 | 267 | 4375 |
| 25 Mar. (84) | 1 Sun. | 34 | 47 | 13 | 55 | 38 | 20 | 15 | 20 | 10 Mar. (69) | 0 Sat. | ⊙ −7 | −.[illegible] | 9984 | 807 | 237 | 4376 |
| 25 Mar. (84) | 2 Mon. | 50 | 19 | 20 | 7 | 53 | 52 | 21 | 33 | 28 Feb. (59) | 5 Thur. | 210 | .630 | 198 | 690 | 208 | 4377 |
| 25 Mar. (85) | 4 Wed. | 5 | 50 | 2 | 20 | 9 | 23 | 3 | 45 | 18 Mar. (78) | 4 Wed. | 273 | .819 | 233 | 626 | 260 | 4378 |
| 25 Mar. (84) | 5 Thur. | 21 | 21 | 8 | 32 | 24 | 55 | 9 | 58 | 7 Mar. (66) | 1 Sun. | 212 | .636 | 109 | 473 | 229 | 4379 |
| 25 Mar. (84) | 6 Fri. | 36 | 52 | 14 | 45 | 40 | 26 | 16 | 10 | 25 Mar. (84) | 6 Fri. | 45 | .135 | 9804 | 373 | 278 | 4380 |
| 25 Mar. (84) | 0 Sat. | 52 | 24 | 20 | 57 | 55 | 58 | 22 | 23 | 15 Mar. (74) | 4 Wed. | 299 | .897 | 19 | 257 | 249 | 4381 |
| 25 Mar. (85) | 2 Mon. | 7 | 55 | 3 | 10 | 11 | 29 | 4 | 36 | 3 Mar. (63) | 1 Sun. | 121 | .363 | 9894 | 104 | 219 | 4382 |
| 25 Mar. (84) | 3 Tues. | 23 | 26 | 9 | 22 | 27 | 1 | 10 | 48 | 22 Mar. (81) | 0 Sat. | 104 | .312 | 9929 | 40 | 270 | 4383 |
| 25 Mar. (84) | 4 Wed. | 38 | 57 | 15 | 35 | 42 | 32 | 17 | 1 | 12 Mar. (71) | 5 Thur. | 217 | .651 | 143 | 923 | 242 | 4384 |
| 25 Mar. (84) | 5 Thur. | 54 | 29 | 21 | 47 | 58 | 1 | 23 | 14 | 1 Mar. (60) | 2 Mon. | 22 | .066 | 19 | 770 | 211 | 4385 |
| 25 Mar. (85) | 0 Sat. | 10 | 0 | 4 | 0 | 13 | 35 | 5 | 26 | 19 Mar. (79) | 1 Sun. | 59 | .177 | 54 | 706 | 263 | 4386 |
| 25 Mar. (84) | 1 Sun. | 25 | 31 | 10 | 12 | 29 | 7 | 11 | 39 | 8 Mar. (67) | 5 Thur. | 22 | .066 | 9930 | 554 | 232 | 4387 |
| 25 Mar. (84) | 2 Mon. | 41 | 2 | 16 | 25 | 44 | 38 | 17 | 51 | 25 Feb. (56) | 2 Mon. | 31 | .093 | 9805 | 401 | 201 | 4388 |
| 25 Mar. (84) | 3 Tues. | 56 | 34 | 22 | 37 | †0 | 10 | †0 | 4 | 16 Mar. (75) | 1 Sun. | 100 | .300 | 9840 | 337 | 252 | 4389 |
| 25 Mar. (85) | 5 Thur. | 12 | 5 | 4 | 50 | 15 | 41 | 6 | 17 | 5 Mar. (65) | 6 Fri. | 332 | .996 | 54 | 220 | 224 | 4390 |
| 25 Mar. (84) | 6 Fri. | 27 | 36 | 11 | 2 | 31 | 13 | 12 | 29 | 23 Mar. (82) | 4 Wed. | ⊙ −14 | −.[illegible] | 9750 | 120 | 273 | 4391 |
| 25 Mar. (84) | 0 Sat. | 43 | 7 | 17 | 15 | 46 | 44 | 18 | 42 | 13 Mar. (72) | 2 Mon. | 109 | .327 | 9965 | 4 | 244 | 4392 |
| 25 Mar. (84) | 1 Sun. | 58 | 39 | 23 | 27 | †2 | 15 | †0 | 54 | 2 Mar. (62) | 0 Sat. | 228 | .684 | 179 | 867 | 216 | 4393 |
| 25 Mar. (85) | 3 Tues. | 14 | 10 | 5 | 40 | 17 | 48 | 7 | 7 | 21 Mar. (81) | 6 Fri. | 228 | .684 | 214 | 828 | 268 | 4394 |
| 25 Mar. (84) | 4 Wed. | 29 | 41 | 11 | 52 | 33 | 19 | 13 | 20 | 10 Mar. (69) | 3 Tues. | 106 | .318 | 89 | 676 | 237 | 4395 |
| 25 Mar. (84) | 5 Thur. | 45 | 12 | 18 | 5 | 48 | 51 | 19 | 32 | 27 Feb. (58) | 0 Sat. | 91 | .273 | 9965 | 517 | 206 | 4396 |

† See footnote p. liii above. ⊙ See Text Art. 101, para. 2.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| Kali. | Saka. | Chaitrâdi. Vikrama. | Mesbâdi (Solar) year in Bengal. | Kollam. | A. D. | Luni-Solar cycle. (Southern.) | Bṛihaspati cycle (Northern) current at Mesha saṅkrânti. | Name of month. | Time of the preceding saṅkrânti expressed in: Lunation parts (t.) | Tithis. | Time of the succeeding saṅkrânti expressed in: Lunation parts (t.) | Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4397 | 1218 | 1353 | 702 | 470-71 | 1295- 96 | 29 Manmatha... | 34 Śârvari...... | ........ | ..... | ..... | ..... | ..... |
| 4398 | 1219 | 1354 | 703 | 471-72 | *1296- 97 | 30 Durmukha... | 35 Plava...... | 9 Mârgaśîrsha<br>10 *Pausha (Ksh.)*<br>12 Phâlguna. | 9991<br>1<br>9964 | 29.973<br>0.003<br>29.892 | 1<br>9954<br>91 | 0.003<br>29.862<br>0.273 |
| 4399 | 1220 | 1355 | 704 | 472-73 | 1297- 98 | 31 Hemalamba | 36 Śubhakṛit... | ........ | ..... | ..... | ..... | ..... |
| 4400 | 1221 | 1356 | 705 | 473-74 | 1298- 99 | 32 Vilamba ... | 37 Śobhana ... | ........ | ..... | ..... | ..... | ..... |
| 4401 | 1222 | 1357 | 706 | 474-75 | 1299-300 | 33 Vikârin...... | 38 Krodhin. | 5 Śrâvaṇa .. | 9661 | 28.983 | 344 | 1.032 |
| 4402 | 1223 | 1358 | 707 | 475-76 | *1300- 1 | 34 Śârvari...... | 39 Viśvâvasu.. | ........ | ..... | ..... | ..... | ..... |
| 4403 | 1224 | 1359 | 708 | 476-77 | 1301- 2 | 35 Plava...... | 40 Parâbhava... | ........ | ..... | ..... | ..... | ..... |
| 4404 | 1225 | 1360 | 709 | 477-78 | 1302- 3 | 36 Śubhakṛit ... | 41 Plavanga.... | 4 Âshâḍha. | 9715 | 29.145 | 554 | 1.662 |
| 4405 | 1226 | 1361 | 710 | 478-79 | 1303- 4 | 37 Śobhana.... | 42 Kîlaka...... | ........ | ..... | ..... | ..... | ..... |
| 4406 | 1227 | 1362 | 711 | 479-80 | *1304- 5 | 38 Krodhin...... | 43 Saumya..... | ........ | ..... | ..... | ..... | ..... |
| 4407 | 1228 | 1363 | 712 | 480-81 | 1305- 6 | 39 Viśvâvasu... | 44 Sâdhâraṇa ... | 2 Vaiśâkha | 9889 | 29.667 | 310 | 0.930 |
| 4408 | 1229 | 1364 | 713 | 481-82 | 1306- 7 | 40 Parâbhava... | 45 Virodhakṛit.. | ........ | ..... | ..... | ..... | ..... |
| 4409 | 1230 | 1365 | 714 | 482-83 | 1307- 8 | 41 Plavanga ... | 46 Paridhâvin. | 6 Bhâdrapada. | 9827 | 29.481 | 250 | 0.750 |
| 4410 | 1231 | 1366 | 715 | 483-84 | *1308- 9 | 42 Kîlaka...... | 47 Pramâdin... | ........ | ..... | ..... | ..... | ..... |
| 4411 | 1232 | 1367 | 716 | 484-85 | 1309- 10 | 43 Saumya..... | 48 Ânanda... | ........ | ..... | ..... | ..... | ..... |
| 4412 | 1233 | 1368 | 717 | 485-86 | 1310- 11 | 44 Sâdhâraṇa.. | 49 Râkshasa.... | 4 Âshâḍha.... | 9239 | 27.717 | 101 | 0.303 |
| 4413 | 1234 | 1369 | 718 | 486-87 | 1311- 12 | 45 Virodhakṛit.. | 50 Anala...... | ........ | ..... | ..... | ..... | ..... |
| 4414 | 1235 | 1370 | 719 | 487-88 | *1312- 13 | 46 Paridhâvin... | 51 Piṅgala..... | ........ | ..... | ..... | ..... | ..... |
| 4415 | 1236 | 1371 | 720 | 488-89 | 1313- 14 | 47 Pramâdin... | 52 Kâlayukta.... | 3 Jyeshṭha. | 9776 | 29.328 | 328 | 0.984 |
| 4416 | 1237 | 1372 | 721 | 489-90 | 1314- 15 | 48 Ânanda...... | 53 Siddhârthin.. | ........ | ..... | ..... | ..... | ..... |
| 4417 | 1238 | 1373 | 722 | 490-91 | 1315- 16 | 49 Râkshasa .... | 54 Raudra .... | 8 Kârttika...<br>9 *Mârgaśîrsha (Ksh.)*<br>12 Phâlguna. | 9950<br>31<br>9917 | 29.850<br>0.093<br>29.751 | 31<br>9996<br>67 | 0.093<br>29.988<br>0.201 |
| 4418 | 1239 | 1374 | 723 | 491-92 | *1316- 17 | 50 Anala ..... | 55 Durmati... | ........ | ..... | ..... | ..... | ..... |
| 4419 | 1240 | 1375 | 724 | 492-93 | 1317- 18 | 51 Piṅgala...... | 56 Dundubhi.... | ........ | ..... | ..... | ..... | ..... |
| 4420 | 1241 | 1376 | 725 | 493-94 | 1318- 19 | 52 Kâlayukta... | 57 Rudhirodgârin | 5 Śrâvaṇa.... | 9648 | 28.944 | 425 | 1.275 |
| 4421 | 1242 | 1377 | 726 | 494-95 | 1319- 20 | 53 Siddhârthin.. | 58 Raktâksha... | ........ | ..... | ..... | ..... | ..... |
| 4422 | 1243 | 1378 | 727 | 495-96 | *1320- 21 | 54 Raudra...... | 59 Krodhana ... | ........ | ..... | ..... | ..... | ..... |
| 4423 | 1244 | 1379 | 728 | 496-97 | 1321- 22 | 55 Durmati ..... | 60 Kshaya ..... | 4 Âshâḍha.... | 9800 | 29.400 | 547 | 1.641 |
| 4424 | 1245 | 1380 | 729 | 497-98 | 1322- 23 | 56 Dundubhi..... | 1 Prabhava ... | ........ | ..... | ..... | ..... | ..... |
| 4425 | 1246 | 1381 | 730 | 498-99 | 1323- 24 | 57 Rudhirodgârin | 2 Vibhava.... | ........ | ..... | ..... | ..... | ..... |

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

III. COMMENCEMENT OF THE

| Solar year. Day and Month A. D. | Solar year. (Time of the Mesha saṅkrânti.) Week day. | By the Ârya Siddhânta. Gh. | Pa. | H. | M. | By the Sûrya Siddhânta. Gh. | Pa. | H. | M. | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. Moon's Age. Lunar. parts elapsed (t.) | Tithis elapsed. | a | b | c | Kali. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | 14 | 15 | | 17 | | 15a | | 17a | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 26 Mar. (85) | 0 Sat. | 0 | 44 | 0 | 17 | 4 | 22 | 1 | 45 | 18 Mar. (77) | 6 Fri. | 181 | .543 | 0 | 453 | 257 | 4397 |
| 25 Mar. (85) | 1 Sun. | 16 | 15 | 6 | 30 | 19 | 54 | 7 | 57 | 6 Mar. (66) | 3 Tues. | 148 | .444 | 9875 | 301 | 226 | 4398 |
| 25 Mar. (84) | 2 Mon. | 31 | 46 | 12 | 42 | 35 | 25 | 14 | 10 | 25 Mar. (84) | 2 Mon. | 191 | .573 | 9910 | 237 | 278 | 4399 |
| 25 Mar. (84) | 3 Tues. | 47 | 17 | 18 | 55 | 50 | 57 | 20 | 23 | 14 Mar. (73) | 6 Fri. | ⊕ —1 | —.003 | 9786 | 84 | 247 | 4400 |
| 26 Mar. (85) | 5 Thur. | 2 | 49 | 1 | 7 | 6 | 28 | 2 | 35 | 4 Mar. (63) | 4 Wed. | 112 | .336 | 0 | 967 | 219 | 4401 |
| 25 Mar. (85) | 6 Fri. | 18 | 20 | 7 | 20 | 22 | 0 | 8 | 48 | 22 Mar. (82) | 3 Tues. | 95 | .285 | 35 | 903 | 270 | 4402 |
| 25 Mar. (84) | 0 Sat. | 33 | 51 | 13 | 32 | 37 | 31 | 15 | 0 | 12 Mar. (71) | 1 Sun. | 253 | .759 | 249 | 787 | 242 | 4403 |
| 25 Mar. (84) | 1 Sun. | 49 | 22 | 19 | 45 | 53 | 3 | 21 | 13 | 1 Mar. (60) | 5 Thur. | 163 | .489 | 125 | 634 | 211 | 4404 |
| 26 Mar. (85) | 3 Tues. | 4 | 54 | 1 | 57 | 8 | 34 | 3 | 26 | 20 Mar. (79) | 4 Wed. | 239 | .717 | 159 | 570 | 263 | 4405 |
| 25 Mar. (85) | 4 Wed. | 20 | 25 | 8 | 10 | 24 | 6 | 9 | 38 | 8 Mar. (68) | 1 Sun. | 245 | .735 | 35 | 417 | 232 | 4406 |
| 25 Mar. (84) | 5 Thur. | 35 | 56 | 14 | 22 | 39 | 37 | 15 | 51 | 25 Feb. (56) | 5 Thur. | 194 | .582 | 9911 | 264 | 201 | 4407 |
| 25 Mar. (84) | 6 Fri. | 51 | 27 | 20 | 35 | 55 | 9 | 22 | 4 | 16 Mar. (75) | 4 Wed. | 219 | .657 | 9946 | 200 | 252 | 4408 |
| 26 Mar. (85) | 1 Sun. | 6 | 59 | 2 | 47 | 10 | 40 | 4 | 16 | 5 Mar. (64) | 1 Sun. | 4 | .012 | 9821 | 48 | 221 | 4409 |
| 25 Mar. (85) | 2 Mon. | 22 | 30 | 9 | 0 | 26 | 12 | 10 | 29 | 23 Mar. (83) | 0 Sat. | ⊕ —18 | —.054 | 9556 | 984 | 273 | 4410 |
| 25 Mar. (84) | 3 Tues. | 38 | 1 | 15 | 12 | 41 | 43 | 16 | 41 | 13 Mar. (72) | 5 Thur. | 106 | .318 | 70 | 867 | 245 | 4411 |
| 25 Mar. (84) | 4 Wed. | 53 | 32 | 21 | 25 | 57 | 15 | 22 | 54 | 3 Mar. (62) | 3 Tues. | 286 | .858 | 285 | 751 | 217 | 4412 |
| 26 Mar. (85) | 6 Fri. | 9 | 4 | 3 | 37 | 12 | 46 | 5 | 7 | 21 Mar. (80) | 1 Sun. | 8 | .024 | 9981 | 650 | 265 | 4413 |
| 25 Mar. (85) | 0 Sat. | 24 | 35 | 9 | 50 | 28 | 18 | 11 | 19 | 10 Mar. (70) | 6 Fri. | 305 | .915 | 195 | 534 | 237 | 4414 |
| 25 Mar. (84) | 1 Sun. | 40 | 6 | 16 | 2 | 43 | 49 | 17 | 32 | 27 Feb. (58) | 3 Tues. | 308 | .924 | 71 | 381 | 206 | 4415 |
| 25 Mar. (84) | 2 Mon. | 55 | 37 | 22 | 15 | 59 | 21 | 23 | 44 | 17 Mar. (76) | 1 Sun. | 42 | .126 | 9767 | 281 | 255 | 4416 |
| 26 Mar. (85) | 4 Wed. | 11 | 9 | 4 | 27 | 14 | 53 | 5 | 57 | 7 Mar. (66) | 6 Fri. | 242 | .726 | 9981 | 164 | 227 | 4417 |
| 25 Mar. (85) | 5 Thur. | 26 | 40 | 10 | 40 | 30 | 24 | 12 | 10 | 25 Mar. (85) | 5 Thur. | 240 | .720 | 16 | 100 | 278 | 4418 |
| 25 Mar. (84) | 6 Fri. | 42 | 11 | 16 | 52 | 45 | 56 | 18 | 22 | 14 Mar. (73) | 2 Mon. | ⊕ —15 | —.045 | 9891 | 947 | 247 | 4419 |
| 25 Mar. (84) | 0 Sat. | 57 | 42 | 23 | 5 | †1 | 27 | †0 | 35 | 4 Mar. (63) | 0 Sat. | 124 | .372 | 106 | 831 | 219 | 4420 |
| 26 Mar. (85) | 2 Mon. | 13 | 14 | 5 | 17 | 16 | 59 | 6 | 47 | 23 Mar. (82) | 6 Fri. | 141 | .423 | 140 | 767 | 270 | 4421 |
| 25 Mar. (85) | 3 Tues. | 28 | 45 | 11 | 30 | 32 | 30 | 13 | 0 | 11 Mar. (71) | 3 Tues. | 64 | .192 | 16 | 614 | 240 | 4422 |
| 25 Mar. (84) | 4 Wed. | 44 | 16 | 17 | 42 | 48 | 2 | 19 | 13 | 28 Feb. (59) | 0 Sat. | 68 | .204 | 9892 | 461 | 209 | 4423 |
| 25 Mar. (84) | 5 Thur. | 59 | 47 | 23 | 55 | †3 | 33 | †1 | 25 | 19 Mar. (78) | 6 Fri. | 151 | .453 | 9926 | 397 | 260 | 4424 |
| 26 Mar. (85) | 0 Sat. | 15 | 19 | 6 | 7 | 19 | 5 | 7 | 38 | 8 Mar. (67) | 3 Tues. | 82 | .246 | 9802 | 244 | 229 | 4425 |

† See footnote p. liii above. ⊕ See Text. Art. 101, para. 2.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| Kali. | Saka. | Chaitrâdi. Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | Luni-Solar cycle. (Southern.) | Bṛihaspati cycle (Northern) current at Mesha saṅkrânti. | Name of month. | Time of the preceding saṅkrânti expressed in: Lunation parts. (*t.*) | Time of the preceding saṅkrânti expressed in: Tithis. | Time of the succeeding saṅkrânti expressed in: Lunation parts. (*t.*) | Time of the succeeding saṅkrânti expressed in: Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4426 | 1247 | 1382 | 731 | 499-500 | *1324-25 | 58 Raktâksha.... | 3 Śukla........ | 2 Vaiśâkha.... | 9956 | 29.868 | 461 | 1.383 |
| 4427 | 1248 | 1383 | 732 | 500- 1 | 1325-26 | 59 Krodhana.... | 4 Pramoda..... | ........ | ...... | ........ | ...... | ...... |
| 4428 | 1249 | 1384 | 733 | 501- 2 | 1326-27 | 60 Kshaya...... | 5 Prajâpati.... | 6 Bhâdrapada. | 9942 | 29.826 | 433 | 1.299 |
| 4429 | 1250 | 1385 | 734 | 502- 3 | 1327-28 | 1 Prabhava... | 6 Aṅgiras..... | ........ | ...... | ........ | ...... | ...... |
| 4430 | 1251 | 1386 | 735 | 503- 4 | *1328-29 | 2 Vibhava...... | 7 Śrîmukha.... | ........ | ...... | ........ | ...... | ...... |
| 4431 | 1252 | 1387 | 736 | 504- 5 | 1329-30 | 3 Śukla........ | 8 Bhâva...... | 4 Âshâḍha.. | 9297 | 27.891 | 74 | 0.222 |
| 4432 | 1253 | 1388 | 737 | 505- 6 | 1330-31 | 4 Pramoda.. | 9 Yuvan...... | ........ | ...... | ........ | ...... | ...... |
| 4433 | 1254 | 1389 | 738 | 506- 7 | 1331-32 | 5 Prajâpati. | 10 Dhâtri..... | ........ | ...... | ........ | ...... | ...... |
| 4434 | 1255 | 1390 | 739 | 507- 8 | *1332-33 | 6 Aṅgiras... | 11 Îśvara....... | 3 Jyeshṭha | 9950 | 29.850 | 515 | 1.545 |
| 4435 | 1256 | 1391 | 740 | 508- 9 | 1333-34 | 7 Śrîmukha.... | 12 Bahudhânya.. | ........ | ...... | ........ | ...... | ...... |
| 4436 | 1257 | 1392 | 741 | 509- 10 | 1334-35 | 8 Bhâva...... | 13 Pramâthin.. | 7 Âśvina......<br>10 *Pausha* (*Ksh.*)<br>12 Phâlguna... | 9909<br>9<br>9915 | 29.727<br>0.027<br>29.745 | 130<br>9942<br>33 | 0.390<br>29.826<br>0.099 |
| 4437 | 1258 | 1393 | 742 | 510- 11 | 1335-36 | 9 Yuvan...... | 14 Vikrama [1].. | ........ | ...... | ........ | ...... | ...... |
| 4438 | 1259 | 1394 | 743 | 511- 12 | *1336-37 | 10 Dhâtri...... | 15 Chitrabhânu. | ........ | ...... | ........ | ...... | ...... |
| 4439 | 1260 | 1395 | 744 | 512- 13 | 1337-38 | 11 Îśvara....... | 17 Subhânu..... | 5 Śrâvaṇa..... | 9609 | 28.827 | 415 | 1.245 |
| 4440 | 1261 | 1396 | 745 | 513- 14 | 1338-39 | 12 Bahudhânya.. | 18 Târaṇa...... | ........ | ...... | ........ | ...... | ...... |
| 4441 | 1262 | 1397 | 746 | 514- 15 | 1339-40 | 13 Pramâthin... | 19 Pârthiva..... | ........ | ...... | ........ | ...... | ...... |
| 4442 | 1263 | 1398 | 747 | 515- 16 | *1340-41 | 14 Vikrama..... | 20 Vyaya...... | 4 Âshâḍha | 9982 | 29.946 | 627 | 1.881 |
| 4443 | 1264 | 1399 | 748 | 516- 17 | 1341-42 | 15 Vṛisha......*. | 21 Sarvajit...... | ........ | ...... | ........ | ...... | ...... |
| 4444 | 1265 | 1400 | 749 | 517- 18 | 1342-43 | 16 Chitrabhânu.. | 22 Sarvadhârin.. | ........ | ...... | ........ | ...... | ...... |
| 4445 | 1266 | 1401 | 750 | 518- 19 | 1343-44 | 17 Subhânu..... | 23 Virodhin..... | 2 Vaiśâkha.. | 9934 | 29.802 | 514 | 1.542 |
| 4446 | 1267 | 1402 | 751 | 519- 20 | *1344-45 | 18 Târaṇa...... | 24 Vikṛita... | ........ | ...... | ........ | ...... | ...... |
| 4447 | 1268 | 1403 | 752 | 520- 21 | 1345-46 | 19 Pârthiva..... | 25 Khara...... | 6 Bhâdrapada.. | 9957 | 29.871 | 538 | 1.614 |
| 4448 | 1269 | 1404 | 753 | 521- 22 | 1346-47 | 20 Vyaya....... | 26 Nandana. | ........ | ...... | ........ | ...... | ...... |
| 4449 | 1270 | 1405 | 754 | 522- 23 | 1347-48 | 21 Sarvajit.... | 27 Vijaya. | ........ | ...... | ........ | ...... | ...... |
| 4450 | 1271 | 1406 | 755 | 523- 24 | *1348-49 | 22 Sarvadhârin | 28 Jaya. | 4 Âshâḍha. | 9448 | 28.344 | 121 | 0.363 |
| 4451 | 1272 | 1407 | 756 | 524- 25 | 1349-50 | 23 Virodhin..... | 29 Manmatha.. | ........ | ...... | ........ | ...... | ...... |
| 4452 | 1273 | 1408 | 757 | 525- 26 | 1350-51 | 24 Vikṛita...... | 30 Durmukha. | ........ | ...... | ........ | ...... | ...... |
| 4453 | 1274 | 1409 | 758 | 526- 27 | 1351-52 | 25 Khara.... | 31 Hemalamba. | 2 Vaiśâkha.... | 9471 | 28.413 | 40 | 0.120 |
| 4454 | 1275 | 1410 | 759 | 527- 28 | *1352-53 | 26 Nandana..... | 32 Vilamba. | ........ | ...... | ........ | ...... | ...... |
| 4455 | 1276 | 1411 | 760 | 528- 29 | 1353-54 | 27 Vijaya....... | 33 Vikârin. | 6 Bhâdrapada | 9495 | 28.485 | 47 | 0.141 |
| 4456 | 1277 | 1412 | 761 | 529- 30 | 1354-55 | 28 Jaya....... | 34 Śârvari.. | ........ | ...... | ........ | ...... | ...... |

[1] Vṛisha, No. 15, was suppressed in the north.

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

| III. COMMENCEMENT OF THE | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Solar year | | | | | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | Kali. |
| Day and Month A. D. | (Time of the Mesha saṅkrânti.) | | | | | | | | | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. | | | | | |
| | Week day. | By the Ârya Siddhânta. | | | | By the Sûrya Siddhânta. | | | | | | Moon's Age. | | a. | b. | c. | |
| | | Gh. | Pa. | H. | M. | Gh. | Pa. | H. | M. | | | Lunar. parts elapsed (t.) | Tithis elapsed. | | | | |
| 13 | 14 | 15 | | 17 | | 15a | | 17a | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 25 Mar. (85).. | 1 Sun.... | 30 | 50 | 12 | 20 | 34 | 36 | 13 | 50 | 26 Feb. (57).. | 1 Sun... | 260 | .780 | 16 | 128 | 201 | 4426 |
| 25 Mar. (84).. | 2 Mon.... | 46 | 21 | 18 | 32 | 50 | 8 | 20 | 3 | 16 Mar. (75).. | 0 Sat... | 246 | .738 | 51 | 64 | 252 | 4427 |
| 26 Mar. (85).. | 4 Wed.... | 1 | 52 | 0 | 45 | 5 | 39 | 2 | 16 | 5 Mar. (64).. | 4 Wed... | ⊙ −4 | −.012 | 9927 | 911 | 222 | 4428 |
| 26 Mar. (85).. | 5 Thur... | 17 | 24 | 6 | 57 | 21 | 11 | 8 | 28 | 24 Mar. (83).. | 3 Tues... | ⊙ −11 | −.033 | 9962 | 847 | 273 | 4429 |
| 25 Mar. (85).. | 6 Fri..... | 32 | 55 | 13 | 10 | 36 | 42 | 14 | 41 | 13 Mar. (73).. | 1 Sun.... | 177 | .531 | 176 | 731 | 245 | 4430 |
| 25 Mar. (84).. | 0 Sat..... | 48 | 26 | 19 | 22 | 52 | 14 | 20 | 54 | 2 Mar. (61).. | 5 Thur... | 128 | .384 | 52 | 578 | 214 | 4431 |
| 26 Mar. (85).. | 2 Mon.... | 3 | 57 | 1 | 35 | 7 | 45 | 3 | 6 | 21 Mar. (80).. | 4 Wed.... | 213 | .639 | 86 | 514 | 265 | 4432 |
| 26 Mar. (85).. | 3 Tues... | 19 | 29 | 7 | 47 | 23 | 17 | 9 | 19 | 10 Mar. (69).. | 1 Sun.... | 209 | .627 | 9962 | 361 | 235 | 4433 |
| 25 Mar. (85).. | 4 Wed.... | 35 | 0 | 14 | 0 | 38 | 48 | 15 | 31 | 27 Feb. (58).. | 5 Thur... | 116 | .348 | 9838 | 208 | 204 | 4434 |
| 25 Mar. (84).. | 5 Thur... | 50 | 31 | 20 | 12 | 54 | 20 | 21 | 44 | 17 Mar. (76).. | 4 Wed.... | 122 | .366 | 9872 | 144 | 255 | 4435 |
| 26 Mar. (85).. | 0 Sat..... | 6 | 2 | 2 | 25 | 9 | 51 | 3 | 57 | 7 Mar. (66).. | 2 Mon.... | 251 | .753 | 87 | 28 | 227 | 4436 |
| 26 Mar. (85).. | 1 Sun.... | 21 | 34 | 8 | 37 | 25 | 23 | 10 | 9 | 26 Mar. (85).. | 1 Sun.... | 231 | .693 | 121 | 964 | 278 | 4437 |
| 25 Mar. (85).. | 2 Mon.... | 37 | 5 | 14 | 50 | 40 | 55 | 16 | 22 | 14 Mar. (74).. | 5 Thur... | 7 | .021 | 9997 | 811 | 247 | 4438 |
| 25 Mar. (84).. | 3 Tues... | 52 | 36 | 21 | 2 | 56 | 26 | 22 | 34 | 4 Mar. (63).. | 3 Tues... | 221 | .663 | 211 | 694 | 219 | 4439 |
| 26 Mar. (85).. | 5 Thur... | 8 | 7 | 3 | 15 | 11 | 58 | 4 | 47 | 23 Mar. (82).. | 2 Mon.... | 284 | .852 | 246 | 630 | 271 | 4440 |
| 26 Mar. (85).. | 6 Fri..... | 23 | 39 | 9 | 27 | 27 | 29 | 11 | 0 | 12 Mar. (71).. | 6 Fri..... | 282 | .846 | 122 | 478 | 240 | 4441 |
| 25 Mar. (85).. | 0 Sat..... | 39 | 10 | 15 | 40 | 43 | 1 | 17 | 12 | 29 Feb. (60).. | 3 Tues... | 264 | .792 | 9997 | 325 | 209 | 4442 |
| 25 Mar. (84).. | 1 Sun.... | 54 | 41 | 21 | 52 | 58 | 32 | 23 | 25 | 19 Mar. (78).. | 2 Mon.... | 312 | .936 | 32 | 261 | 260 | 4443 |
| 26 Mar. (85).. | 3 Tues... | 10 | 12 | 4 | 5 | 14 | 4 | 5 | 37 | 8 Mar. (67).. | 6 Fri..... | 137 | .411 | 9908 | 109 | 230 | 4444 |
| 26 Mar. (85).. | 4 Wed.... | 25 | 44 | 10 | 17 | 29 | 35 | 11 | 50 | 26 Feb. (57).. | 4 Wed.... | 258 | .774 | 122 | 992 | 201 | 4445 |
| 25 Mar. (85).. | 5 Thur... | 41 | 15 | 16 | 30 | 45 | 7 | 18 | 3 | 16 Mar. (76).. | 3 Tues... | 235 | .705 | 157 | 928 | 253 | 4446 |
| 25 Mar. (84).. | 6 Fri..... | 56 | 46 | 22 | 42 | †0 | 38 | †0 | 15 | 5 Mar. (64).. | 0 Sat..... | 35 | .105 | 32 | 775 | 222 | 4447 |
| 26 Mar. (85).. | 1 Sun.... | 12 | 17 | 4 | 55 | 16 | 10 | 6 | 28 | 24 Mar. (83).. | 6 Fri..... | 71 | .213 | 67 | 711 | 273 | 4448 |
| 26 Mar. (85).. | 2 Mon.... | 27 | 49 | 11 | 7 | 31 | 41 | 12 | 41 | 13 Mar. (72).. | 3 Tues... | 33 | .099 | 9943 | 558 | 242 | 4449 |
| 25 Mar. (85).. | 3 Tues... | 43 | 20 | 17 | 20 | 47 | 13 | 18 | 53 | 1 Mar. (61).. | 0 Sat..... | 39 | .117 | 9818 | 405 | 212 | 4450 |
| 25 Mar. (84).. | 4 Wed.... | 58 | 51 | 23 | 32 | †2 | 44 | †1 | 6 | 20 Mar. (79).. | 6 Fri..... | 111 | .333 | 9853 | 341 | 263 | 4451 |
| 26 Mar. (85).. | 6 Fri..... | 14 | 22 | 5 | 45 | 18 | 16 | 7 | 18 | 9 Mar. (68).. | 3 Tues... | ⊙ −2 | −.006 | 9729 | 188 | 232 | 4452 |
| 26 Mar. (85).. | 0 Sat..... | 29 | 54 | 11 | 57 | 33 | 47 | 13 | 31 | 27 Feb. (58).. | 1 Sun.... | 148 | .444 | 9043 | 72 | 204 | 4453 |
| 25 Mar. (85).. | 1 Sun.... | 45 | 25 | 18 | 10 | 49 | 19 | 19 | 44 | 17 Mar. (77).. | 0 Sat..... | 125 | .375 | 9976 | 8 | 255 | 4454 |
| 26 Mar. (85).. | 3 Tues... | 0 | 56 | 0 | 22 | 4 | 50 | 1 | 56 | 7 Mar. (66).. | 5 Thur... | 243 | .729 | 192 | 891 | 227 | 4455 |
| 26 Mar. (85).. | 4 Wed.... | 16 | 27 | 6 | 35 | 20 | 22 | 8 | 9 | 26 Mar. (85).. | 4 Wed.... | 244 | .732 | 227 | 827 | 279 | 4456 |

† See footnote p. liii above. ⊙ See Text. Art. 101 above, para. 2.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR | | | | | | | | II. ADDED LUNAR MONTHS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Saṁvatsara | | True | | | | |
| Kali | Saka | Chaitrâdi Vikrama | Meshâdi (Solar) year in Bengal | Kollam. | A. D. | Luni-Solar cycle (Southern.) | Bṛihaspati cycle (Northern) current at Mesha saṅkrânti | Name of month | Time of the preceding saṅkrânti expressed in | | Time of the succeeding saṅkrânti expressed in | |
| | | | | | | | | | Lunation parts (*l.*) | Tithis. | Lunation parts (*l.*) | Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4457 | 1278 | 1413 | 762 | 530-31 | 1355-56 | 29 Manmatha ... | 35 Plava.. | | | | | |
| 4458 | 1279 | 1414 | 763 | 531-32 | *1356-57 | 30 Durmukha ... | 36 Śubhakrit | 5 Śrâvaṇa | 9624 | 28.872 | 374 | 1.122 |
| 4459 | 1280 | 1415 | 764 | 532-33 | 1357-58 | 31 Hemalamba... | 37 Śobhana. | | | | | |
| 4460 | 1281 | 1416 | 765 | 533-34 | 1358-59 | 32 Vilamba .. | 38 Krodhin | | | | | |
| 4461 | 1282 | 1417 | 766 | 534-35 | 1359-60 | 33 Vikârin . | 39 Viśvâvasu | 3 Jyeshṭha. | 9556 | 28.668 | 174 | 0.522 |
| 4462 | 1283 | 1418 | 767 | 535-36 | *1360-61 | 34 Śârvari ... | 40 Parâbhava | | | | | |
| 4463 | 1284 | 1419 | 768 | 536-37 | 1361-62 | 35 Plava ..... | 41 Plavaṅga | | | | | |
| 4464 | 1285 | 1420 | 769 | 537-38 | 1362-63 | 36 Śubhakrit ... | 42 Kîlaka | 2 Vaiśâkha | 9898 | 29.694 | 490 | 1.470 |
| 4465 | 1286 | 1421 | 770 | 538-39 | 1363-64 | 37 Śobhana..... | 43 Saumya | | | | | |
| 4466 | 1287 | 1422 | 771 | 539-40 | *1364-65 | 38 Krodhin ..... | 44 Sâdhâraṇa | 6 Bhâdrapada | 9918 | 29.754 | 544 | 1.632 |
| 4467 | 1288 | 1423 | 772 | 540-41 | 1365-66 | 39 Viśvâvasu.... | 45 Virodhakrit | | | | | |
| 4468 | 1289 | 1424 | 773 | 541-42 | 1366-67 | 40 Parâbhava... | 46 Paridhâvin | | | | | |
| 4469 | 1290 | 1425 | 774 | 542-43 | 1367-68 | 41 Plavaṅga... | 47 Pramâdin | 4 Âshâḍha | 9647 | 28.941 | 268 | 0.804 |
| 4470 | 1291 | 1426 | 775 | 543-44 | *1368-69 | 42 Kîlaka ..... | 48 Ânanda | | | | | |
| 4471 | 1292 | 1427 | 776 | 544-45 | 1369-70 | 43 Saumya...... | 49 Râkshasa.. | | | | | |
| 4472 | 1293 | 1428 | 777 | 545-46 | 1370-71 | 44 Sâdhâraṇa.... | 50 Anala | 2 Vaiśâkha | 9438 | 28.314 | 36 | 0.108 |
| 4473 | 1294 | 1429 | 778 | 546-47 | 1371-72 | 45 Virodhakrit . | 51 Piṅgala | | | | | |
| 4474 | 1295 | 1430 | 779 | 547-48 | *1372-73 | 46 Paridhâvin... | 52 Kâlayukta . | 6 Bhâdrapada | 9464 | 28.392 | 83 | 0.249 |
| 4475 | 1296 | 1431 | 780 | 548-49 | 1373-74 | 47 Pramâdin... | 53 Siddhârthin | | | | | |
| 4476 | 1297 | 1432 | 781 | 549-50 | 1374-75 | 48 Ânanda .. | 54 Raudra | | | | | |
| 4477 | 1298 | 1433 | 782 | 550-51 | 1375-76 | 49 Râkshasa. | 55 Durmati | 5 Śrâvaṇa | 9743 | 29.229 | 389 | 1.167 |
| 4478 | 1299 | 1434 | 783 | 551-52 | *1376-77 | 50 Anala | 56 Dundubhi | | | | | |
| 4479 | 1300 | 1435 | 784 | 552-53 | 1377-78 | 51 Piṅgala | 57 Rudhirodgârin | | | | | |
| 4480 | 1301 | 1436 | 785 | 553-54 | 1378-79 | 52 Kâlayukta. | 58 Raktâksha. | 3 Jyeshṭha | 9577 | 28.731 | 296 | 0.888 |
| 4481 | 1302 | 1437 | 786 | 554-55 | 1379-80 | 53 Siddhârthin . | 59 Krodhana | | | | | |
| 4482 | 1303 | 1438 | 787 | 555-56 | *1380-81 | 54 Raudra . | 60 Kshaya | 8 Kârttika<br>9 *Mârgas. Ksh.* | 9937<br>15 | 29.811<br>0.045 | 15<br>9927 | 0.045<br>29.781 |
| 4483 | 1304 | 1439 | 788 | 556-57 | 1381-82 | 55 Durmati | 1 Prabhava | 2 Vaiśâkha | 9927 | 29.781 | 455 | 1.365 |
| 4484 | 1305 | 1440 | 789 | 557-58 | 1382-83 | 56 Dundubhi | 2 Vibhava. | | | | | |
| 4485 | 1306 | 1441 | 790 | 558-59 | 1383-84 | 57 Rudhirodgârin | 3 Śukla | 6 Bhâdrapada | 9906 | 29.718 | 500 | 1.500 |
| 4486 | 1307 | 1442 | 791 | 559-60 | *1384-85 | 58 Raktâksha. | 4 Pramoda | | | | | |
| 4487 | 1308 | 1443 | 792 | 560-61 | 1385-86 | 59 Krodhana | 5 Prajâpati ... | | | | | |
| 4488 | 1309 | 1444 | 793 | 561-62 | 1386-87 | 60 Kshaya . | 6 Aṅgiras..... | 4 Âshâḍha | 9799 | 29.397 | 427 | 1.281 |

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

III. COMMENCEMENT OF THE

| Solar year. | | | | | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Day and Month A. D. | (Time of the Mesha saṅkrânti.) | | | | | | | | | Day and Month A. D. | Week day | At Sunrise on meridian of Ujjain. | | | | | Kali. |
| | Week day. | By the Ârya Siddhânta. | | | | By the Sûrya Siddhânta. | | | | | | Moon's Age. | | *a.* | *b.* | *c.* | |
| | | Gh. | Pa. | H. | M. | Gh. | Pa. | H. | M. | | | Lunar. parts elapsed. (*t.*) | Tithis elapsed. | | | | |
| 13 | 14 | 15 | | 17 | | 15a | | 17a | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 26 Mar. (85).. | 5 Thur... | 31 | 59 | 12 | 47 | 35 | 53 | 14 | 21 | 15 Mar. (74) | 1 Sun... | 118 | .354 | 108 | 674 | 248 | 4457 |
| 25 Mar. (85).. | 6 Fri. | 47 | 30 | 19 | 0 | 51 | 25 | 20 | 34 | 3 Mar. (63).. | 5 Thur... | 99 | .297 | 9978 | 522 | 217 | 4458 |
| 26 Mar. (85).. | 1 Sun... | 3 | 1 | 1 | 12 | 6 | 57 | 2 | 47 | 22 Mar. (81).. | 4 Wed.... | 180 | .540 | 18 | 458 | 268 | 4459 |
| 26 Mar. (85).. | 2 Mon... | 18 | 32 | 7 | 25 | 22 | 28 | 8 | 59 | 11 Mar. (70).. | 1 Sun... | 161 | .483 | 9889 | 305 | 237 | 4460 |
| 26 Mar. (85).. | 3 Tues.... | 34 | 4 | 13 | 37 | 38 | 0 | 15 | 12 | 28 Feb. (59).. | 5 Thur... | 20 | .060 | 9764 | 153 | 207 | 4461 |
| 25 Mar. (85).. | 4 Wed.... | 49 | 35 | 19 | 50 | 53 | 31 | 21 | 24 | 18 Mar. (78).. | 4 Wed.... | 13 | .039 | 9799 | 88 | 258 | 4462 |
| 26 Mar. (85).. | 6 Fri... | 5 | 6 | 2 | 2 | 9 | 3 | 3 | 37 | 8 Mar. (67).. | 2 Mon... | 139 | .417 | 13 | 972 | 230 | 4463 |
| 26 Mar. (85).. | 0 Sat.... | 20 | 37 | 8 | 15 | 24 | 34 | 9 | 50 | 26 Feb. (57).. | 0 Sat.... | 260 | .780 | 228 | 855 | 202 | 4464 |
| 26 Mar. (85).. | 1 Sun.... | 36 | 9 | 14 | 27 | 40 | 6 | 16 | 2 | 17 Mar. (76).. | 6 Fri.... | 266 | .798 | 262 | 791 | 253 | 4465 |
| 25 Mar. (85).. | 2 Mon.... | 51 | 40 | 20 | 40 | 55 | 37 | 22 | 15 | 5 Mar. (65).. | 3 Tues... | 173 | .519 | 138 | 638 | 222 | 4466 |
| 26 Mar. (85).. | 4 Wed.... | 7 | 11 | 2 | 52 | 11 | 9 | 4 | 27 | 24 Mar. (83).. | 2 Mon.... | 250 | .750 | 173 | 574 | 273 | 4467 |
| 26 Mar. (85).. | 5 Thur... | 22 | 42 | 9 | 5 | 26 | 40 | 10 | 40 | 13 Mar. (72).. | 6 Fri. | 254 | .762 | 48 | 422 | 243 | 4468 |
| 26 Mar. (85).. | 6 Fri.... | 38 | 14 | 15 | 17 | 42 | 12 | 16 | 53 | 2 Mar. (61).. | 3 Tues.. | 205 | .615 | 9924 | 269 | 212 | 4469 |
| 25 Mar. (85).. | 0 Sat.... | 53 | 45 | 21 | 30 | 57 | 43 | 23 | 5 | 20 Mar. (80).. | 2 Mon... | 233 | .699 | 9959 | 205 | 263 | 4470 |
| 26 Mar. (85).. | 2 Mon... | 9 | 16 | 3 | 42 | 13 | 15 | 5 | 18 | 9 Mar. (68).. | 6 Fri.... | 21 | .063 | 9835 | 52 | 232 | 4471 |
| 26 Mar. (85).. | 3 Tues.... | 24 | 47 | 9 | 55 | 28 | 46 | 11 | 31 | 27 Feb. (58).. | 4 Wed.... | 137 | .411 | 49 | 936 | 204 | 4472 |
| 26 Mar. (85).. | 4 Wed.... | 40 | 19 | 16 | 7 | 44 | 18 | 17 | 43 | 18 Mar. (77).. | 3 Tues... | 122 | .366 | 83 | 871 | 256 | 4473 |
| 25 Mar. (85).. | 5 Thur.. | 55 | 50 | 22 | 20 | 59 | 49 | 23 | 56 | 7 Mar. (67).. | 1 Sun.... | 298 | .894 | 298 | 755 | 227 | 4474 |
| 26 Mar. (85).. | 0 Sat.... | 11 | 21 | 4 | 32 | 15 | 21 | 6 | 8 | 25 Mar. (84).. | 6 Fri.... | 20 | .060 | 9994 | 655 | 276 | 4475 |
| 26 Mar. (85).. | 1 Sun... | 26 | 52 | 10 | 45 | 30 | 52 | 12 | 21 | 15 Mar. (74).. | 4 Wed.... | 315 | .945 | 208 | 538 | 246 | 4476 |
| 26 Mar. (85).. | 2 Mon... | 42 | 24 | 16 | 57 | 46 | 24 | 18 | 34 | 4 Mar. (63).. | 1 Sun... | 318 | .954 | 84 | 385 | 217 | 4477 |
| 25 Mar. (85).. | 3 Tues... | 57 | 55 | 23 | 10 | 61 | 55 | 24 | 46 | 21 Mar. (81).. | 6 Fri.... | 57 | .171 | 9780 | 285 | 266 | 4478 |
| 26 Mar. (85).. | 5 Thur... | 13 | 26 | 5 | 22 | 17 | 27 | 6 | 59 | 11 Mar. (70).. | 4 Wed.... | 256 | .768 | 9994 | 168 | 238 | 4479 |
| 26 Mar. (85).. | 6 Fri.... | 28 | 57 | 11 | 35 | 32 | 59 | 13 | 11 | 28 Feb. (59).. | 1 Sun... | 26 | .078 | 9870 | 16 | 207 | 4480 |
| 26 Mar. (85).. | 0 Sat... | 44 | 29 | 17 | 47 | 48 | 30 | 19 | 24 | 19 Mar. (78).. | 0 Sat.... | 3 | .009 | 9905 | 952 | 258 | 4481 |
| †26 Mar. (86).. | 2 Mon... | 0 | 0 | 0 | 0 | 4 | 2 | 1 | 37 | 8 Mar. (68).. | 5 Thur... | 138 | .414 | 119 | 835 | 230 | 4482 |
| 26 Mar. (85).. | 3 Tues.... | 15 | 31 | 6 | 12 | 19 | 33 | 7 | 49 | 25 Feb. (56).. | 2 Mon... | 10 | .030 | 9995 | 682 | 199 | 4483 |
| 26 Mar. (85).. | 4 Wed.... | 31 | 2 | 12 | 25 | 35 | 5 | 14 | 2 | 16 Mar. (75).. | 1 Sun.... | 74 | .222 | 29 | 618 | 250 | 4484 |
| 26 Mar. (85).. | 5 Thur... | 46 | 34 | 18 | 37 | 50 | 36 | 20 | 14 | 5 Mar. (64).. | 5 Thur... | 77 | .231 | 9905 | 466 | 220 | 4485 |
| 26 Mar. (85).. | 0 Sat.... | 2 | 5 | 0 | 50 | 6 | 8 | 2 | 27 | 23 Mar. (83).. | 4 Wed.... | 161 | .483 | 9940 | 402 | 271 | 4486 |
| 26 Mar. (85).. | 1 Sun.... | 17 | 36 | 7 | 2 | 21 | 39 | 8 | 40 | 12 Mar. (71).. | 1 Sun... | 95 | .285 | 9815 | 249 | 240 | 4487 |
| 26 Mar. (85).. | 2 Mon... | 33 | 7 | 13 | 15 | 37 | 11 | 14 | 52 | 2 Mar. (61).. | 6 Fri.. | 275 | .825 | 30 | 132 | 212 | 4488 |

† See footnote p. liii above.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR | | | | | | | | II. ADDED LUNAR MONTHS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| | | | | | | | | | Time of the preceding saṅkrânti expressed in | | Time of the succeeding saṅkrânti expressed in | |
| Kali. | Saka. | Chaitrâdi Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | Luni-Solar cycle (Southern.) | Brihaspati cycle (Northern) current at Mesha saṅkrânti. | Name of month | Lunation parts. (*l.*) | Tithis. | Lunation parts. (*l.*) | Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4489 | 1310 | 1445 | 794 | 562-63 | 1387- 88 | 1 Prabhava...... | 7 Srîmukha...... | | ...... | ...... | ...... | ...... |
| 4490 | 1311 | 1446 | 795 | 563-64 | *1388- 89 | 2 Vibhava...... | 8 Bhâva...... | | ...... | ...... | ...... | ...... |
| 4491 | 1312 | 1447 | 796 | 564-65 | 1389- 90 | 3 Sukla...... | 9 Yuvan...... | 3 Jyeshṭha...... | 9991 | 29.973 | 879 | 2.637 |
| 4492 | 1313 | 1448 | 797 | 565-66 | 1390- 91 | 4 Pramoda...... | 10 Dhâtri...... | | ...... | ...... | ...... | ...... |
| 4493 | 1314 | 1449 | 798 | 566-67 | 1391- 92 | 5 Prajâpati...... | 11 Îsvara...... | 6 Bhâdrapada | 9433 | 28.299 | 48 | 0.144 |
| 4494 | 1315 | 1450 | 799 | 567-68 | *1392- 93 | 6 Aṅgiras...... | 12 Bahudhânya | | ...... | ...... | ...... | ...... |
| 4495 | 1316 | 1451 | 800 | 568-69 | 1393- 94 | 7 Śrîmukha...... | 13 Pramâthin...... | | ...... | ...... | ...... | ...... |
| 4496 | 1317 | 1452 | 801 | 569-70 | 1394- 95 | 8 Bhâva...... | 14 Vikrama...... | 5 Śrâvaṇa...... | 9932 | 29.796 | 501 | 1.503 |
| 4497 | 1318 | 1453 | 802 | 570-71 | 1395- 96 | 9 Yuvan...... | 15 Vrisha...... | | ...... | ...... | ...... | ...... |
| 4498 | 1319 | 1454 | 803 | 571-72 | *1396- 97 | 10 Dhâtri...... | 16 Chitrabhânu.. | | ...... | ...... | ...... | ...... |
| 4499 | 1320 | 1455 | 804 | 572-73 | 1397- 98 | 11 Îsvara...... | 17 Subhânu...... | 3 Jyeshṭha...... | 9538 | 28.614 | 327 | 0.981 |
| 4500 | 1321 | 1456 | 805 | 573-74 | 1398- 99 | 12 Bahudhânya.. | 18 Târaṇa...... | | ...... | ...... | ...... | ...... |
| 4501 | 1322 | 1457 | 806 | 574-75 | 1399-400 | 13 Pramâthin...... | 19 Pârthiva...... | 8 Kârttika...... | 9981 | 29.943 | 121 | 0.363 |
| | | | | | | | | 10 *Pausha (Ksh.)* | 80 | 0.240 | 9950 | 29.850 |
| 4502 | 1323 | 1458 | 807 | 575-76 | *1400- 1 | 14 Vikrama...... | 20 Vyaya...... | 1 Chaitra...... | 9862 | 29.586 | 56 | 0.168 |
| 4503 | 1324 | 1459 | 808 | 576-77 | 1401- 2 | 15 Vrisha...... | 21 Sarvajit...... | | ...... | ...... | ...... | ...... |
| 4504 | 1325 | 1460 | 809 | 577-78 | 1402- 3 | 16 Chitrabhânu.. | 22 Sarvadhârin.. | 6 Bhâdrapada.. | 9989 | 29.967 | 499 | 1.497 |
| 4505 | 1326 | 1461 | 810 | 578-79 | 1403- 4 | 17 Subhânu...... | 23 Virodhin...... | | ...... | ...... | ...... | ...... |
| 4506 | 1327 | 1462 | 811 | 579-80 | *1404- 5 | 18 Târaṇa...... | 24 Vikṛita...... | | ...... | ...... | ...... | ...... |
| 4507 | 1328 | 1463 | 812 | 580-81 | 1405- 6 | 19 Pârthiva...... | 25 Khara...... | 4 Âshâḍha...... | 9855 | 29.565 | 625 | 1.875 |
| 4508 | 1329 | 1464 | 813 | 581-82 | 1406- 7 | 20 Vyaya...... | 26 Nandana...... | | ...... | ...... | ...... | ...... |
| 4509 | 1330 | 1465 | 814 | 582-83 | 1407- 8 | 21 Sarvajit...... | 27 Vijaya...... | | ...... | ...... | ...... | ...... |
| 4510 | 1331 | 1466 | 815 | 583-84 | *1408- 9 | 22 Sarvadhârin.. | 28 Jaya...... | 2 Vaiśâkha...... | 9535 | 28.605 | 1 | 0.003 |
| 4511 | 1332 | 1467 | 816 | 584-85 | 1409- 10 | 23 Virodhin...... | 29 Manmatha...... | | ...... | ...... | ...... | ...... |
| 4512 | 1333 | 1468 | 817 | 585-86 | 1410- 11 | 24 Vikrita...... | 30 Durmukha...... | 6 Bhâdrapada.. | 9483 | 28.449 | 23 | 0.069 |
| 4513 | 1334 | 1469 | 818 | 586-87 | 1411- 12 | 25 Khara...... | 31 Hemalamba.. | | ...... | ...... | ...... | ...... |
| 4514 | 1335 | 1470 | 819 | 587-88 | *1412- 13 | 26 Nandana...... | 32 Vilamba...... | | ...... | ...... | ...... | ...... |
| 4515 | 1336 | 1471 | 820 | 588-89 | 1413- 14 | 27 Vijaya...... | 33 Vikârin...... | 4 Âshâḍha...... | 9380 | 28.140 | 112 | 0.336 |
| 4516 | 1337 | 1472 | 821 | 589-90 | 1414- 15 | 28 Jaya...... | 34 Śârvari...... | ...... | ...... | ...... | ...... | ...... |
| 4517 | 1338 | 1473 | 822 | 590-91 | 1415- 16 | 29 Manmatha...... | 35 Plava...... | | ...... | ...... | ...... | ...... |
| 4518 | 1339 | 1474 | 823 | 591-92 | *1416- 17 | 30 Durmukha...... | 36 Śubhakṛit...... | 3 Jyeshṭha...... | 9536 | 28.608 | 282 | 0.846 |
| 4519 | 1340 | 1475 | 824 | 592-93 | 1417- 18 | 31 Hemalamba... | 37 Śobhana...... | | ...... | ...... | ...... | ...... |
| 4520 | 1341 | 1476 | 825 | 593-94 | 1418- 19 | 32 Vilamba...... | 38 Krodhin...... | 8 Kârttika...... | 9951 | 29.853 | 130 | 0.390 |

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

| III. COMMENCEMENT OF THE | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Solar year. | | | | | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | Kali |
| Day and Month A. D. | (Time of the Mesha sankrânti.) | | | | | | | | | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. | | | | | |
| | Week day | By the Ârya Siddhânta. | | | | By the Sûrya Siddhânta. | | | | | | Moon's Age | | a. | b. | c. | |
| | | Gh. | Pa. | H. | M. | Gh. | Pa. | H. | M. | | | Lunar parts elapsed (*t*.) | Tithis elapsed | | | | |
| 13 | 14 | 15 | | 17 | | 15a | | 17a | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 26 Mar. (85).. | 3 Tues.... | 48 | 39 | 19 | 37 | 52 | 42 | 21 | 5 | 21 Mar. (80).. | 5 Thur... | 262 | .786 | 64 | 68 | 263 | 4489 |
| 26 Mar. (86).. | 5 Thur. .. | 4 | 10 | 1 | 40 | 8 | 14 | 3 | 17 | 9 Mar. (69). | 2 Mon.... | 9 | .027 | 9940 | 916 | 232 | 4490 |
| 26 Mar. (85).. | 6 Fri..... | 19 | 41 | 7 | 52 | 23 | 45 | 9 | 30 | 27 Feb. (58).. | 0 Sat..... | 164 | .492 | 154 | 799 | 204 | 4491 |
| 26 Mar.†(85).. | 0 Sat..... | 35 | 12 | 14 | 5 | 39 | 17 | 15 | 43 | 18 Mar. (77).. | 6 Fri..... | 190 | .570 | 189 | 735 | 256 | 4492 |
| 26 Mar. (85).. | 1 Sun. .. | 50 | 44 | 20 | 17 | 54 | 48 | 21 | 55 | 7 Mar. (66).. | 3 Tues... | 136 | .408 | 65 | 582 | 225 | 4493 |
| 26 Mar. (86).. | 3 Tues.... | 6 | 15 | 2 | 30 | 10 | 20 | 4 | 8 | 25 Mar. (85).. | 2 Mon .. | 224 | .672 | 99 | 518 | 276 | 4494 |
| 26 Mar. (85).. | 4 Wed. . | 21 | 46 | 8 | 42 | 25 | 51 | 10 | 21 | 14 Mar. (73).. | 6 Fri .. | 220 | .660 | 9975 | 365 | 245 | 4495 |
| 26 Mar. (85).. | 5 Thur... | 37 | 17 | 14 | 55 | 41 | 23 | 16 | 33 | 3 Mar. (62).. | 3 Tues. | 129 | .387 | 9851 | 213 | 215 | 4496 |
| 26 Mar. (85).. | 6 Fri..... | 52 | 49 | 21 | 7 | 56 | 54 | 22 | 46 | 22 Mar. (81).. | 2 Mon.... | 138 | .414 | 9886 | 149 | 266 | 4497 |
| 26 Mar. (86).. | 1 Sun.... | 8 | 20 | 3 | 20 | 12 | 26 | 4 | 58 | 11 Mar. (71).. | 0 Sat ... | 268 | .804 | 100 | 32 | 238 | 4498 |
| 26 Mar. (85).. | 2 Mon.... | 23 | 51 | 9 | 32 | 27 | 57 | 11 | 11 | 28 Feb. (59).. | 4 Wed.... | 21 | .063 | 9976 | 879 | 207 | 4499 |
| 26 Mar. (85).. | 3 Tues.... | 39 | 22 | 15 | 45 | 43 | 29 | 17 | 24 | 19 Mar. (78).. | 3 Tues... | 21 | .063 | 10 | 815 | 258 | 4500 |
| 26 Mar. (85).. | 4 Wed. | 54 | 54 | 21 | 57 | 59 | 1 | 23 | 36 | 9 Mar. (68).. | 1 Sun ... | 231 | .693 | 224 | 699 | 230 | 4501 |
| 26 Mar. (86).. | 6 Fri..... | 10 | 25 | 4 | 10 | 14 | 32 | 5 | 49 | 26 Feb. (57) | 5 Thur.. | 203 | .609 | 100 | 546 | 199 | 4502 |
| 26 Mar. (85).. | 0 Sat. | 25 | 56 | 10 | 22 | 30 | 4 | 12 | 1 | 16 Mar. (75).. | 4 Wed... | 291 | .873 | 135 | 482 | 251 | 4503 |
| 26 Mar. (85).. | 1 Sun.... | 41 | 27 | 16 | 35 | 45 | 35 | 18 | 14 | 5 Mar. (64). | 1 Sun .. | 275 | .825 | 11 | 329 | 220 | 4504 |
| 26 Mar. (85).. | 2 Mon.... | 56 | 59 | 22 | 47 | †1 | 7 | †0 | 27 | 24 Mar. (83).. | 0 Sat.... | 325 | .973 | 45 | 265 | 271 | 4505 |
| 26 Mar. (86).. | 4 Wed.... | 12 | 30 | 5 | 0 | 16 | 38 | 6 | 39 | 12 Mar. (72).. | 4 Wed ... | 152 | .456 | 9921 | 112 | 240 | 4506 |
| 26 Mar. (85).. | 5 Thur | 28 | 1 | 11 | 12 | 32 | 10 | 12 | 52 | 2 Mar. (61).. | 2 Mon .. | 273 | .819 | 135 | 996 | 212 | 4507 |
| 26 Mar. (85).. | 6 Fri. .. | 43 | 32 | 17 | 25 | 47 | 41 | 19 | 4 | 21 Mar. (80).. | 1 Sun | 252 | .756 | 170 | 932 | 264 | 4508 |
| 26 Mar. (85).. | 0 Sat..... | 59 | 4 | 23 | 37 | †3 | 13 | †1 | 17 | 10 Mar. (69) . | 5 Thur ... | 49 | .147 | 46 | 779 | 233 | 4509 |
| 26 Mar. (86).. | 2 Mon. .. | 14 | 35 | 5 | 50 | 18 | 44 | 7 | 30 | 28 Feb. (59).. | 3 Tues ... | 285 | .855 | 260 | 663 | 205 | 4510 |
| 26 Mar. (85).. | 3 Tues.... | 30 | 6 | 12 | 2 | 34 | 16 | 13 | 42 | 17 Mar. (76).. | 1 Sun . | 42 | .126 | 9956 | 562 | 253 | 4511 |
| 26 Mar. (85).. | 4 Wed.... | 45 | 37 | 18 | 15 | 49 | 47 | 19 | 55 | 6 Mar. (65).. | 5 Thur.. | 48 | .144 | 9832 | 410 | 222 | 4512 |
| 27 Mar. (86).. | 6 Fri..... | 1 | 9 | 0 | 27 | 5 | 19 | 2 | 8 | 25 Mar. (84).. | 4 Wed.... | 122 | .366 | 9866 | 345 | 274 | 4513 |
| 26 Mar. (86).. | 0 Sat..... | 16 | 40 | 6 | 40 | 20 | 50 | 8 | 20 | 13 Mar. (73) . | 1 Sun . | 13 | .039 | 9742 | 193 | 243 | 4514 |
| 26 Mar. (85).. | 1 Sun.... | 32 | 11 | 12 | 52 | 36 | 22 | 14 | 33 | 3 Mar. (62).. | 6 Fri. | 163 | .489 | 9956 | 76 | 215 | 4515 |
| 26 Mar. (85).. | 2 Mon.... | 47 | 42 | 19 | 5 | 51 | 53 | 20 | 45 | 22 Mar. (81).. | 5 Thur . | 142 | .426 | 9991 | 12 | 266 | 4516 |
| 27 Mar. (86).. | 4 Wed.... | 3 | 14 | 1 | 17 | 7 | 25 | 2 | 58 | 12 Mar. (71).. | 3 Tues.. | 259 | .777 | 205 | 896 | 238 | 4517 |
| 26 Mar. (86).. | 5 Thur... | 18 | 45 | 7 | 30 | 22 | 56 | 9 | 11 | 29 Feb. (60).. | 0 Sat. | 83 | .249 | 81 | 743 | 207 | 4518 |
| 26 Mar. (85).. | 6 Fri.... | 34 | 16 | 13 | 42 | 38 | 28 | 15 | 23 | 19 Mar. (78).. | 6 Fri..... | 129 | .387 | 116 | 679 | 259 | 4519 |
| 26 Mar. (85).. | 0 Sat..... | 49 | 47 | 19 | 55 | 53 | 59 | 21 | 36 | 8 Mar. (67).. | 3 Tues. | 109 | .327 | 9992 | 526 | 228 | 4520 |

† See footnote p. liii above.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| Kali. | Saka. | Chaitrâdi Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | Luni-Solar cycle. (Southern.) | Bṛihaspati cycle (Northern) current at Mesha saṅkrânti. | Name of month. | Time of the preceding saṅkrânti expressed in Lunation parts (t.) | Time of the preceding saṅkrânti expressed in Tithis. | Time of the succeeding saṅkrânti expressed in Lunation parts (t.) | Time of the succeeding saṅkrânti expressed in Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4521 | 1342 | 1477 | 826 | 594- 95 | 1419-20 | 33 Vikârin | 39 Viśvâvasu | | | | | |
| 4522 | 1343 | 1478 | 827 | 595- 96 | *1420-21 | 34 Śârvari | 40 Parâbhava ¹) | | | | | |
| 4523 | 1344 | 1479 | 828 | 596- 97 | 1421-22 | 35 Plava | 42 Kîlaka | 5 Śrâvaṇa | 9592 | 28.776 | 162 | 0.486 |
| 4524 | 1345 | 1480 | 829 | 597- 98 | 1422-23 | 36 Śubhakṛit | 43 Saumya | | | | | |
| 4525 | 1346 | 1481 | 830 | 598- 99 | 1423-24 | 37 Śobhana | 44 Sâdhâraṇa | | | | | |
| 4526 | 1347 | 1482 | 831 | 599-600 | *1424-25 | 38 Krodhin | 45 Virodhakṛit | 4 Âshâḍha | 9829 | 29.487 | 686 | 2.058 |
| 4527 | 1348 | 1483 | 832 | 600- 1 | 1425-26 | 39 Viśvâvasu | 46 Paridhâvin | | | | | |
| 4528 | 1349 | 1484 | 833 | 601- 2 | 1426-27 | 40 Parâbhava | 47 Pramâdin | | | | | |
| 4529 | 1350 | 1485 | 834 | 602- 3 | 1427-28 | 41 Plavaṅga | 48 Ânanda | 2 Vaiśâkha | 9715 | 29.145 | 111 | 0.333 |
| 4530 | 1351 | 1486 | 835 | 603- 4 | *1428-29 | 42 Kîlaka | 49 Râkshasa | | | | | |
| 4531 | 1352 | 1487 | 836 | 604- 5 | 1429-30 | 43 Saumya | 50 Anala | 6 Bhâdrapada | 9629 | 28.887 | 81 | 0.243 |
| 4532 | 1353 | 1488 | 837 | 605- 6 | 1430-31 | 44 Sâdhâraṇa | 51 Piṅgala | | | | | |
| 4533 | 1354 | 1489 | 838 | 606- 7 | 1431-32 | 45 Virodhakṛit | 52 Kâlayukta | | | | | |
| 4534 | 1355 | 1490 | 839 | 607- 8 | *1432-33 | 46 Paridhâvin | 53 Siddhârthin | 4 Âshâḍha | 9374 | 28.122 | 173 | 0.519 |
| 4535 | 1356 | 1491 | 840 | 608- 9 | 1433-34 | 47 Pramâdin | 54 Raudra | | | | | |
| 4536 | 1357 | 1492 | 841 | 609- 10 | 1434-35 | 48 Ânanda | 55 Durmati | | | | | |
| 4537 | 1358 | 1493 | 842 | 610- 11 | 1435-36 | 49 Râkshasa | 56 Dundubhi | 3 Jyeshṭha | 9596 | 28.788 | 264 | 0.792 |
| 4538 | 1359 | 1494 | 843 | 611- 12 | *1436-37 | 50 Anala | 57 Rudhirodgârin | | | | | |
| 4539 | 1360 | 1495 | 844 | 612- 13 | 1437-38 | 51 Piṅgala | 58 Raktâksha | 8 Kârttika | 9922 | 29.766 | 90 | 0.270 |
| 4540 | 1361 | 1496 | 845 | 613- 14 | 1438-39 | 52 Kâlayukta | 59 Krodhana | | | | | |
| 4541 | 1362 | 1497 | 846 | 614- 15 | 1439-40 | 53 Siddhârthin | 60 Kshaya | | | | | |
| 4542 | 1363 | 1498 | 847 | 615- 16 | *1440-41 | 54 Raudra | 1 Prabhava | 5 Śrâvaṇa | 9721 | 29.163 | 355 | 1.065 |
| 4543 | 1364 | 1499 | 848 | 616- 17 | 1441-42 | 55 Durmati | 2 Vibhava | | | | | |
| 4544 | 1365 | 1500 | 849 | 617- 18 | 1442-43 | 56 Dundubhi | 3 Śukla | | | | | |
| 4545 | 1366 | 1501 | 850 | 618- 19 | 1443-44 | 57 Rudhirodgârin | 4 Pramoda | 4 Âshâḍha | 9795 | 29.385 | 664 | 1.992 |
| 4546 | 1367 | 1502 | 851 | 619- 20 | *1444-45 | 58 Raktâksha | 5 Prajâpati | | | | | |
| 4547 | 1368 | 1503 | 852 | 620- 21 | 1445-46 | 59 Krodhana | 6 Aṅgiras | | | | | |
| 4548 | 1369 | 1504 | 853 | 621- 22 | 1446-47 | 60 Kshaya | 7 Śrîmukha | 2 Vaiśâkha | 9904 | 29.712 | 297 | 0.891 |
| 4549 | 1370 | 1505 | 854 | 622- 23 | 1447-48 | 1 Prabhava | 8 Bhâva | | | | | |
| 4550 | 1371 | 1506 | 855 | 623- 24 | *1448-49 | 2 Vibhava | 9 Yuvan | 6 Bhâdrapada | 9825 | 29.475 | 236 | 0.708 |
| 4551 | 1372 | 1507 | 856 | 624- 25 | 1449-50 | 3 Śukla | 10 Dhâtṛi | | | | | |
| 4552 | 1373 | 1508 | 857 | 625- 26 | 1450-51 | 4 Pramoda | 11 Îśvara | | | | | |
| 4553 | 1374 | 1509 | 858 | 626- 27 | 1451-52 | 5 Prajâpati | 12 Bahudhânya | 4 Âshâḍha | 9332 | 27.996 | 209 | 0.627 |

¹) Plavanga No. 41 was suppressed in the North.

# TABLE I.

(*Col.* 23) *a* = *Distance of moon from sun.* (*Col.* 24) *b* = *moon's mean anomaly.* (*Col.* 25) *c* = *sun's mean anomaly.*

## III. COMMENCEMENT OF THE

| Solar year. | | | | | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | Kali. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Day and Month A. D. | (Time of the Mesha saṅkrânti.) Week day | By the Ârya Siddhânta | | | | By the Sûrya Siddhânta. | | | | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. Moon's Age: Lunar parts elapsed (*t*.) | Tithis elapsed. | *a* | *b*. | *c*. | |
| | | Gh. | Pa. | H. | M. | Gh. | Pa. | H. | M. | | | | | | | | |
| 13 | 14 | 15 | | 17 | | 15a | | 17a | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 27 Mar. (86)†.. | 2 Mon... | 5 | 19 | 2 | 7 | 9 | 31 | 3 | 48 | 27 Mar. (86).. | 2 Mon .. | 200 | .600 | 26 | 462 | 279 | 4521 |
| 26 Mar (86).. | 3 Tues.... | 20 | 50 | 8 | 20 | 25 | 9 | 10 | 1 | 15 Mar. (75).. | 6 Fri. ... | 172 | .516 | 9902 | 309 | 246 | 4522 |
| 26 Mar. (85).. | 4 Wed.... | 36 | 21 | 14 | 32 | 40 | 34 | 16 | 14 | 4 Mar. (63).. | 3 Tues... | 35 | .105 | 9775 | 156 | 217 | 4523 |
| 26 Mar. (85).. | 5 Thur... | 51 | 52 | 20 | 45 | 56 | 6 | 22 | 26 | 23 Mar. (82).. | 2 Mon... | 29 | .087 | 9812 | 92 | 269 | 4524 |
| 27 Mar (86).. | 0 Sat. .. | 7 | 24 | 2 | 57 | 11 | 37 | 4 | 39 | 13 Mar. (72).. | 0 Sat..... | 146 | .438 | 27 | 976 | 241 | 4525 |
| 26 Mar. (86).. | 1 Sun.... | 22 | 55 | 9 | 10 | 27 | 9 | 10 | 51 | 2 Mar. (62).. | 5 Thur... | 275 | .825 | 241 | 860 | 213 | 4526 |
| 26 Mar. (85).. | 2 Mon... | 38 | 26 | 15 | 22 | 42 | 40 | 17 | 4 | 21 Mar. (80).. | 4 Wed.... | 282 | .846 | 276 | 795 | 264 | 4527 |
| 26 Mar. (85).. | 3 Tues... | 53 | 57 | 21 | 35 | 58 | 12 | 23 | 17 | 10 Mar. (69).. | 1 Sun.... | 182 | .546 | 151 | 643 | 233 | 4528 |
| 27 Mar. (86).. | 5 Thur. | 9 | 29 | 3 | 47 | 13 | 43 | 5 | 29 | 27 Feb. (58).. | 5 Thur.. | 179 | .537 | 27 | 490 | 202 | 4529 |
| 26 Mar. (86).. | 6 Fri..... | 25 | 0 | 10 | 0 | 29 | 15 | 11 | 42 | 17 Mar. (77).. | 4 Wed... | 265 | .795 | 62 | 426 | 253 | 4530 |
| 26 Mar. (85).. | 0 Sat..... | 40 | 31 | 16 | 12 | 44 | 46 | 17 | 54 | 6 Mar. (65).. | 1 Sun.... | 216 | .648 | 9937 | 273 | 223 | 4531 |
| 26 Mar. (85).. | 1 Sun .. | 56 | 2 | 22 | 25 | +0 | 18 | +0 | 7 | 25 Mar. (84).. | 0 Sat..... | 248 | .744 | 9972 | 209 | 274 | 4532 |
| 27 Mar. (86).. | 3 Tues. . | 11 | 34 | 4 | 37 | 15 | 49 | 6 | 20 | 14 Mar. (73).. | 4 Wed.... | 37 | .111 | 9848 | 56 | 243 | 4533 |
| 26 Mar. (86) .. | 4 Wed. . | 27 | 5 | 10 | 50 | 31 | 21 | 12 | 33 | 3 Mar. (63).. | 2 Mon.... | 151 | .453 | 62 | 940 | 215 | 4534 |
| 26 Mar (85).. | 5 Thur. | 42 | 36 | 17 | 2 | 46 | 52 | 18 | 45 | 22 Mar. (81).. | 1 Sun... | 139 | .417 | 97 | 876 | 266 | 4535 |
| 26 Mar (85).. | 6 Fri. ... | 58 | 7 | 23 | 15 | +2 | 24 | +0 | 57 | 12 Mar. (71).. | 6 Fri..... | 311 | .933 | 311 | 759 | 238 | 4536 |
| 27 Mar. (86).. | 1 Sun... | 13 | 39 | 5 | 27 | 17 | 55 | 7 | 10 | 1 Mar. (60).. | 3 Tues... | 242 | .726 | 187 | 606 | 207 | 4537 |
| 26 Mar. (86).. | 2 Mon. . | 29 | 10 | 11 | 40 | 33 | 27 | 13 | 23 | 19 Mar. (79) .. | 2 Mon... | 324 | .972 | 221 | 542 | 259 | 4538 |
| 26 Mar. (85).. | 3 Tues... | 44 | 41 | 17 | 52 | 48 | 58 | 19 | 35 | 8 Mar. (67). | 6 Fri.. .. | 327 | .981 | 97 | 390 | 228 | 4539 |
| 27 Mar. (86).. | 5 Thur... | 0 | 12 | 0 | 5 | 4 | 30 | 1 | 48 | 26 Mar. (85).. | 4 Wed... | 70 | .210 | 9793 | 289 | 276 | 4540 |
| 27 Mar. (86).. | 6 Fri..... | 15 | 44 | 6 | 17 | 20 | 1 | 8 | 1 | 16 Mar. (75).. | 2 Mon.... | 272 | .816 | 8 | 173 | 245 | 4541 |
| 26 Mar. (86).. | 0 Sat..... | 31 | 15 | 12 | 30 | 35 | 33 | 14 | 13 | 4 Mar. (64).. | 6 Fri..... | 42 | .126 | 9883 | 20 | 215 | 4542 |
| 26 Mar. (85).. | 1 Sun... | 46 | 46 | 18 | 42 | 51 | 4 | 20 | 26 | 23 Mar. (82).. | 5 Thur... | 19 | .057 | 9916 | 956 | 269 | 4543 |
| 27 Mar. (86).. | 3 Tues.. | 2 | 17 | 0 | 55 | 6 | 36 | 2 | 38 | 13 Mar. (72).. | 3 Tues.... | 154 | .462 | 132 | 840 | 241 | 4544 |
| 27 Mar. (86).. | 4 Wed.. | 17 | 49 | 7 | 7 | 22 | 8 | 8 | 51 | 2 Mar. (61).. | 0 Sat.. .. | 21 | .063 | 6 | 687 | 210 | 4545 |
| 26 Mar. (86).. | 5 Thur | 33 | 20 | 13 | 20 | 37 | 39 | 15 | 4 | 20 Mar. (80).. | 6 Fri.. | 85 | .255 | 45 | 623 | 261 | 4546 |
| 26 Mar. (85).. | 6 Fri.... | 48 | 51 | 19 | 32 | 53 | 11 | 21 | 16 | 9 Mar. (68).. | 3 Tues.. | 84 | .252 | 9918 | 470 | 230 | 4547 |
| 27 Mar. (86).. | 1 Sun.. | 4 | 22 | 1 | 45 | 8 | 42 | 3 | 29 | 26 Feb. (57).. | 0 Sat... | 65 | .195 | 9794 | 317 | 200 | 4548 |
| 27 Mar. (86).. | 2 Mon.. | 19 | 54 | 7 | 57 | 24 | 14 | 9 | 41 | 17 Mar. (76).. | 6 Fri.... | 109 | .327 | 9829 | 253 | 251 | 4549 |
| 26 Mar. (86).. | 3 Tues... | 35 | 25 | 14 | 10 | 39 | 45 | 15 | 54 | 6 Mar. (66).. | 4 Wed.... | 290 | .870 | 43 | 137 | 223 | 4550 |
| 26 Mar. (85).. | 4 Wed.... | 50 | 56 | 20 | 22 | 55 | 17 | 22 | 7 | 25 Mar. (84).. | 3 Tues. .. | 280 | .840 | 78 | 73 | 274 | 4551 |
| 27 Mar. (86).. | 6 Fri. .. | 6 | 27 | 2 | 35 | 10 | 48 | 4 | 19 | 14 Mar. (73).. | 0 Sat..... | 25 | .075 | 9953 | 920 | 243 | 4552 |
| 27 Mar. (86).. | 0 Sat..... | 21 | 59 | 8 | 47 | 26 | 20 | 10 | 32 | 4 Mar. (63).. | 5 Thur... | 177 | .531 | 165 | 803 | 215 | 4553 |

† See footnote p. liii above.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara | | True | | | | |
| | | | | | | | | | Time of the preceding sankrânti expressed in | | Time of the succeeding sankrânti expressed in | |
| Kali. | Saka. | Chaitrâdi Vikrama | Meshâdi (Solar) year in Bengal | Kollam. | A. D. | Luni-Solar cycle. (Southern.) | Brihaspati cycle (Northern) current at Mesha sankrânti | Name of month | Lunation parts (l.) | Tithis. | Lunation parts (l.) | Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4554 | 1375 | 1510 | 859 | 627-28 | *1452-53 | 6 Angiras...... | 13 Pramâthin | ...... | ...... | ...... | ...... | ...... |
| 4555 | 1376 | 1511 | 860 | 628-29 | 1453-54 | 7 Śrîmukha.... | 14 Vikrama.. | ...... | ...... | ...... | ...... | ...... |
| 4556 | 1377 | 1512 | 861 | 629-30 | 1454-55 | 8 Bhâva....... | 15 Vrisha .. .. | 3 Jyeshṭha . | 9764 | 29.292 | 338 | 1.014 |
| 4557 | 1378 | 1513 | 862 | 630-31 | 1455-56 | 9 Yuvan ...... | 16 Chitrabhânu.. | ...... | ...... | ...... | ...... | ...... |
| 4558 | 1379 | 1514 | 863 | 631-32 | *1456-57 | 10 Dhâtri....... | 17 Subhânu..... | 8 Kârttika ... | 9971 | 29.913 | 84 | 0.252 |
| 4559 | 1380 | 1515 | 864 | 632-33 | 1457-58 | 11 Îśvara....... | 18 Târaṇa. ... | ...... | ...... | ...... | ...... | ...... |
| 4560 | 1381 | 1516 | 865 | 633-34 | 1458-59 | 12 Bahudhânya.. | 19 Pârthiva..... | ...... | ...... | ...... | ...... | ...... |
| 4561 | 1382 | 1517 | 866 | 634-35 | 1459-60 | 13 Pramâthin.... | 20 Vyaya....... | 5 Śrâvaṇa..... | 9750 | 29.250 | 485 | 1.455 |
| 4562 | 1383 | 1518 | 867 | 635-36 | *1460-61 | 14 Vikrama...... | 21 Sarvajit...... | ...... | ...... | ...... | ...... | ...... |
| 4563 | 1384 | 1519 | 868 | 636-37 | 1461-62 | 15 Vṛisha....... | 22 Sarvadhârin... | ...... | ...... | ...... | ...... | ...... |
| 4564 | 1385 | 1520 | 869 | 637-38 | 1462-63 | 16 Chitrabhânu.. | 23 Virodhin .... | 4 Âshâḍha | 9836 | 29.508 | 626 | 1.878 |
| 4565 | 1386 | 1521 | 870 | 638-39 | 1463-64 | 17 Subhânu..... | 24 Vikṛita...... | ...... | ...... | ...... | ...... | ...... |
| 4566 | 1387 | 1522 | 871 | 639-40 | *1464-65 | 18 Târaṇa....... | 25 Khara.. | ...... | ...... | ...... | ...... | ...... |
| 4567 | 1388 | 1523 | 872 | 640-41 | 1465-66 | 19 Pârthiva..... | 26 Nandana..... | 1 Chaitra. .. | 9712 | 29.136 | 21 | 0.063 |
| 4568 | 1389 | 1524 | 873 | 641-42 | 1466-67 | 20 Vyaya....... | 27 Vijaya...... | ...... | ...... | ...... | ...... | ...... |
| 4569 | 1390 | 1525 | 874 | 642-43 | 1467-68 | 21 Sarvajit...... | 28 Jaya....... | 6 Bhâdrapada . | 9983 | 29.949 | 433 | 1.299 |
| 4570 | 1391 | 1526 | 875 | 643-44 | *1468-69 | 22 Sarvadhârin.. | 29 Manmatha.... | ...... | ...... | ...... | ...... | ...... |
| 4571 | 1392 | 1527 | 876 | 644-45 | 1469-70 | 23 Virodhin..... | 30 Durmukha.... | ...... | ...... | ...... | ...... | ...... |
| 4572 | 1393 | 1528 | 877 | 645-46 | 1470-71 | 24 Vikṛita...... | 31 Hemalamba... | 4 Âshâḍha... | 9342 | 28.026 | 164 | 0.492 |
| 4573 | 1394 | 1529 | 878 | 646-47 | 1471-72 | 25 Khara....... | 32 Vilamba...... | ...... | ...... | ...... | ...... | ...... |
| 4574 | 1395 | 1530 | 879 | 647-48 | *1472-73 | 26 Nandana..... | 33 Vikârin...... | ...... | ...... | ...... | ...... | ...... |
| 4575 | 1396 | 1531 | 880 | 648-49 | 1473-74 | 27 Vijaya....... | 34 Śârvari..... | 3 Jyeshṭha . | 9959 | 29.877 | 507 | 1.521 |
| 4576 | 1397 | 1532 | 881 | 649-50 | 1474-75 | 28 Jaya ........ | 35 Plava....... | ...... | ...... | ...... | ...... | ...... |
| 4577 | 1398 | 1533 | 882 | 650-51 | 1475-76 | 29 Manmatha.... | 36 Śubhakṛit... | 7 Âśvina....<br>11 *Mâgha (Ksh.)*<br>12 Phâlguna . | 9902<br>16<br>9990 | 29.706<br>0.048<br>29.970 | 121<br>9990<br>131 | 0.363<br>29.970<br>0.393 |
| 4578 | 1399 | 1534 | 883 | 651-52 | *1476-77 | 30 Durmukha.... | 37 Śobhana..... | ...... | ...... | ...... | ...... | ...... |
| 4579 | 1400 | 1535 | 884 | 652-53 | 1477-78 | 31 Hemalamba... | 38 Krodhin .... | ...... | ...... | ...... | ...... | ...... |
| 4580 | 1401 | 1536 | 885 | 653-54 | 1478-79 | 32 Vilamba..... | 39 Viśvâvasu... | 5 Śrâvaṇa . | 9712 | 29.136 | 516 | 1.548 |
| 4581 | 1402 | 1537 | 886 | 654-55 | 1479-80 | 33 Vikârin...... | 40 Parâbhava... | ...... | ...... | ...... | ...... | ...... |
| 4582 | 1403 | 1538 | 887 | 655-56 | *1480-81 | 34 Śârvari...... | 41 Plavaṅga. .. | ...... | ...... | ...... | ...... | ...... |
| 4583 | 1404 | 1539 | 888 | 656-57 | 1481-82 | 35 Plava........ | 42 Kîlaka..... | 4 Âshâḍha .. | 9974 | 29.922 | 661 | 1.983 |
| 4584 | 1405 | 1540 | 889 | 657-58 | 1482-83 | 36 Śubhakṛit.... | 43 Saumya. ... | ...... | ...... | ...... | ...... | ...... |

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

III. COMMENCEMENT OF THE

| Solar year. | | | | | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Day and Month A. D. | (Time of the Mesha saṅkrânti.) | | | | | | | | | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. | | | | | | Kali. |
| | Week day. | By the Ârya Siddhânta. | | | | By the Sûrya Siddhânta. | | | | | | Moon's Age. | | | | | | |
| | | Gh. | Pa. | H. | M. | Gh. | Pa. | H. | M. | | | Lunar parts elapsed. (t.) | Tithis elapsed. | a. | b. | c. | | |
| 13 | 14 | 15 | | 17 | | 15a | | 17a | | 19 | * 20 | 21 | 22 | 23 | 24 | 25 | | 1 |
| 26 Mar. (85).. | 1 Sun.... | 37 | 30 | 15 | 0 | 41 | 51 | 16 | 44 | 22 Mar. (82).. | 4 Wed.... | 202 | .606 | 202 | 739 | 267 | | 4554 |
| 26 Mar. (85).. | 2 Mon.... | 53 | 1 | 21 | 12 | 57 | 23 | 22 | 57 | 11 Mar. (70).. | 1 Sun.... | 146 | .438 | 78 | 586 | 236 | | 4555 |
| 27 Mar. (86).. | 4 Wed.... | 8 | 32 | 3 | 25 | 12 | 54 | 5 | 10 | 28 Feb. (59).. | 5 Thur... | 154 | .462 | 9954 | 434 | 205 | | 4556 |
| 27 Mar. (86).. | 5 Thur... | 24 | 4 | 9 | 37 | 28 | 26 | 11 | 22 | 19 Mar. (78).. | 4 Wed.... | 230 | .690 | 9988 | 370 | 256 | | 4557 |
| 26 Mar. (86).. | 6 Fri..... | 39 | 35 | 15 | 50 | 43 | 57 | 17 | 35 | 7 Mar. (67).. | 1 Sun.... | 142 | .426 | 9864 | 217 | 225 | | 4558 |
| 26 Mar. (85).. | 0 Sat..... | 55 | 6 | 22 | 2 | 59 | 29 | 23 | 48 | 26 Mar. (85).. | 0 Sat..... | 155 | .465 | 9899 | 153 | 277 | | 4559 |
| 27 Mar. (86).. | 2 Mon.... | 10 | 37 | 4 | 15 | 15 | 0 | 6 | 0 | 16 Mar. (75).. | 5 Thur... | 284 | .852 | 113 | 36 | 249 | | 4560 |
| 27 Mar. (86).. | 3 Tues.... | 26 | 9 | 10 | 27 | 30 | 32 | 12 | 13 | 5 Mar. (64).. | 2 Mon.... | 36 | .108 | 9989 | 884 | 218 | | 4561 |
| 26 Mar. (86).. | 4 Wed.... | 41 | 40 | 16 | 40 | 46 | 3 | 18 | 25 | 23 Mar. (83).. | 1 Sun.... | 36 | .108 | 23 | 820 | 269 | | 4562 |
| 26 Mar. (85).. | 5 Thur... | 57 | 11 | 22 | 52 | †1 | 35 | †0 | 38 | 13 Mar. (72).. | 6 Fri..... | 244 | .732 | 238 | 708 | 241 | | 4563 |
| 27 Mar. (86).. | 0 Sat..... | 12 | 42 | 5 | 5 | 17 | 6 | 6 | 51 | 2 Mar. (61).. | 3 Tues.... | 212 | .636 | 114 | 550 | 210 | | 4564 |
| 27 Mar. (86).. | 1 Sun.... | 28 | 14 | 11 | 17 | 32 | 38 | 13 | 3 | 21 Mar. (80).. | 2 Mon.... | 301 | .903 | 148 | 486 | 262 | | 4565 |
| 26 Mar. (86).. | 2 Mon.... | 43 | 45 | 17 | 30 | 48 | 10 | 19 | 16 | 9 Mar. (69).. | 6 Fri..... | 285 | .855 | 24 | 334 | 231 | | 4566 |
| 26 Mar. (85).. | 3 Tues.... | 59 | 16 | 23 | 42 | †3 | 41 | †1 | 28 | 26 Feb. (57).. | 3 Tues.... | 170 | .510 | 9900 | 181 | 200 | | 4567 |
| 27 Mar. (86).. | 5 Thur... | 14 | 47 | 5 | 55 | 19 | 13 | 7 | 41 | 17 Mar. (76).. | 2 Mon.... | 168 | .504 | 9934 | 117 | 251 | | 4568 |
| 27 Mar. (86).. | 6 Fri..... | 30 | 19 | 12 | 7 | 34 | 44 | 13 | 54 | 7 Mar. (66).. | 0 Sat..... | 290 | .870 | 149 | 0 | 223 | | 4569 |
| 26 Mar. (86).. | 0 Sat..... | 45 | 50 | 18 | 20 | 50 | 16 | 20 | 6 | 25 Mar. (85).. | 6 Fri..... | 268 | .804 | 183 | 936 | 274 | | 4570 |
| 27 Mar. (86).. | 2 Mon.... | 1 | 21 | 0 | 32 | 5 | 47 | 2 | 19 | 14 Mar. (73).. | 3 Tues.... | 62 | .186 | 59 | 783 | 244 | | 4571 |
| 27 Mar. (86).. | 3 Tues.... | 16 | 52 | 6 | 45 | 21 | 19 | 8 | 31 | 4 Mar. (63).. | 1 Sun.... | 293 | .879 | 273 | 630 | 216 | | 4572 |
| 27 Mar. (86).. | 4 Wed.... | 32 | 24 | 12 | 57 | 36 | 50 | 14 | 44 | 22 Mar. (81).. | 6 Fri..... | 51 | .153 | 9969 | 567 | 264 | | 4573 |
| 26 Mar. (86).. | 5 Thur... | 47 | 55 | 19 | 10 | 52 | 22 | 20 | 57 | 10 Mar. (70). | 3 Tues.... | 57 | .171 | 9845 | 414 | 233 | | 4574 |
| 27 Mar. (86).. | 0 Sat..... | 3 | 26 | 1 | 22 | 7 | 53 | 3 | 9 | 27 Feb. (58).. | 0 Sat..... | 4 | .012 | 9721 | 261 | 203 | | 4575 |
| 27 Mar. (86).. | 1 Sun.... | 18 | 57 | 7 | 35 | 23 | 25 | 9 | 22 | 18 Mar. (77).. | 6 Fri..... | 27 | .081 | 9755 | 197 | 254 | | 4576 |
| 27 Mar. (86).. | 2 Mon.... | 34 | 29 | 13 | 47 | 38 | 56 | 15 | 35 | 8 Mar. (67).. | 4 Wed.... | 178 | .534 | 9970 | 80 | 226 | | 4577 |
| 26 Mar. (86).. | 3 Tues.... | 50 | 0 | 20 | 0 | 54 | 28 | 21 | 47 | 26 Mar. (86).. | 3 Tues.... | 160 | .480 | 4 | 17 | 277 | | 4578 |
| 27 Mar. (86).. | 5 Thur... | 5 | 31 | 2 | 12 | 9 | 59 | 4 | 0 | 16 Mar. (75).. | 1 Sun.... | 276 | .828 | 219 | 900 | 249 | | 4579 |
| 27 Mar. (86). | 6 Fri..... | 21 | 2 | 8 | 25 | 25 | 31 | 10 | 12 | 5 Mar. (64).. | 5 Thur... | 95 | .285 | 94 | 747 | 218 | | 4580 |
| 27 Mar. (86).. | 0 Sat..... | 36 | 34 | 14 | 37 | 41 | 2 | 16 | 25 | 24 Mar. (83).. | 4 Wed.... | 141 | .423 | 129 | 683 | 269 | | 4581 |
| 26 Mar. (86). | 1 Sun.... | 52 | 5 | 20 | 50 | 56 | 34 | 22 | 38 | 12 Mar. (72).. | 1 Sun.... | 118 | .354 | 5 | 531 | 239 | | 4582 |
| 27 Mar. (86).. | 3 Tues.... | 7 | 36 | 3 | 2 | 12 | 5 | 4 | 50 | 1 Mar. (60).. | 5 Thur... | 119 | .357 | 9880 | 378 | 208 | | 4583 |
| 27 Mar. (86).. | 4 Wed.... | 23 | 7 | 9 | 15 | 27 | 37 | 11 | 3 | 20 Mar. (79).. | 4 Wed.... | 184 | .552 | 9915 | 314 | 259 | | 4584 |

† See footnote p. liii above.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS. True. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kali. | Śaka. | Chaitrâdi. Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | Samvatsara. Luni-Solar cycle. (Southern.) | Samvatsara. Bṛihaspati cycle (Northern) current at Mesha saṅkrânti. | Name of month | Time of the preceding saṅkrânti expressed in Lunation parts (l.) | Time of the preceding saṅkrânti expressed in Tithis. | Time of the succeeding saṅkrânti expressed in Lunation parts (l.) | Time of the succeeding saṅkrânti expressed in Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4585 | 1406 | 1541 | 890 | 658-59 | 1483- 84 | 37 Śobhana..... | 44 Sâdhâraṇa | ...... | ... | | | ... |
| 4586 | 1407 | 1542 | 891 | 659-60 | *1484- 85 | 38 Krodhin..... | 45 Virodhakṛit. | 1 Chaitra | 9679 | 29.037 | 41 | 0.123 |
| 4587 | 1408 | 1543 | 892 | 660-61 | 1485- 86 | 39 Viśvâvasu.... | 46 Paridhâvin | | | | | |
| 4588 | 1409 | 1544 | 893 | 661-62 | 1486- 87 | 40 Parâbhava.... | 47 Pramâdin | 5 Śrâvaṇa | 9259 | 27.777 | 48 | 0.144 |
| 4589 | 1410 | 1545 | 894 | 662-63 | 1487- 88 | 41 Plavaṅga .... | 48 Ânanda | | | | | |
| 4590 | 1411 | 1546 | 895 | 663-64 | *1488- 89 | 42 Kîlaka...... | 49 Râkshasa | | | | | |
| 4591 | 1412 | 1547 | 896 | 664-65 | 1489- 90 | 43 Saumya,..... | 50 Anala | 4 Âshâḍha | 9451 | 28.353 | 170 | 0.510 |
| 4592 | 1413 | 1548 | 897 | 665-66 | 1490- 91 | 44 Sâdhâraṇa ... | 51 Piṅgala | | | | | |
| 4593 | 1414 | 1549 | 898 | 666-67 | 1491- 92 | 45 Virodhakṛit.. | 52 Kâlayukta | | | | | |
| 4594 | 1415 | 1550 | 899 | 667-68 | *1492- 93 | 46 Paridhâvin... | 53 Siddhârthin | 2 Vaiśâkha | 9575 | 28.725 | 94 | 0.282 |
| 4595 | 1416 | 1551 | 900 | 668-69 | 1493- 94 | 47 Pramâdin.... | 54 Raudra. | | | | | |
| 4596 | 1417 | 1552 | 901 | 669-70 | 1494- 95 | 48 Ânanda... | 55 Durmati | 6 Bhâdrapada. | 9569 | 28.707 | 75 | 0.225 |
| 4597 | 1418 | 1553 | 902 | 670-71 | 1495- 96 | 49 Râkshasa .... | 56 Dundubhi | | | | | |
| 4598 | 1419 | 1554 | 903 | 671-72 | *1496- 97 | 50 Anala...... | 57 Rudhirodgârin | | | | | |
| 4599 | 1420 | 1555 | 904 | 672-73 | 1497- 98 | 51 Piṅgala...... | 58 Raktâksha | 5 Śrâvaṇa | 9689 | 29.067 | 478 | 1.434 |
| 4600 | 1421 | 1556 | 905 | 673-74 | 1498- 99 | 52 Kâlayukta .. | 59 Krodhana | | | | | |
| 4601 | 1422 | 1557 | 906 | 674-75 | 1499-500 | 53 Siddhârthin | 60 Kshaya | | | | | |
| 4602 | 1423 | 1558 | 907 | 675-76 | *1500- 1 | 54 Raudra | 1 Prabhava | 3 Jyeshṭha | 9590 | 28.770 | 167 | 0.501 |
| 4603 | 1424 | 1559 | 908 | 676-77 | 1501- 2 | 55 Durmati ... | 2 Vibhava | | | | | |
| 4604 | 1425 | 1560 | 909 | 677-78 | 1502- 3 | 56 Dundubhi.... | 3 Śukla....... | | | | | |
| 4605 | 1426 | 1561 | 910 | 678-79 | 1503- 4 | 57 Rudhirodgârin | 4 Pramoda..... | 1 Chaitra..... | 9653 | 28.959 | 4 | 0.012 |
| 4606 | 1427 | 1562 | 911 | 679-80 | *1504- 5 | 58 Raktâksha... | 5 Prajâpati. | | | | | |
| 4607 | 1428 | 1563 | 912 | 680-81 | 1505- 6 | 59 Krodhana... | 6 Aṅgiras. ... | 5 Śrâvaṇa | 9225 | 27.675 | 28 | 0.084 |
| 4608 | 1429 | 1564 | 913 | 681-82 | 1506- 7 | 60 Kshaya...... | 7 Śrîmukha.... | | | | | |
| 4609 | 1430 | 1565 | 914 | 682-83 | 1507- 8 | 1 Prabhava..... | 8 Bhâva........ | | | | | |
| 4610 | 1431 | 1566 | 915 | 683-84 | *1508- 9 | 2 Vibhava...... | 9 Yuvan....... | 4 Âshâḍha.... | 9630 | 28.890 | 269 | 0.807 |
| 4611 | 1432 | 1567 | 916 | 684-85 | 1509- 10 | 3 Śukla....... | 10 Dhâtṛi....... | | | | | |
| 4612 | 1433 | 1568 | 917 | 685-86 | 1510- 11 | 4 Pramoda..... | 11 Îśvara....... | | | | | |
| 4613 | 1434 | 1569 | 918 | 686-87 | 1511- 12 | 5 Prajâpati | 12 Bahudhânya | 2 Vaiśâkha | 9551 | 28.653 | 137 | 0.411 |
| 4614 | 1435 | 1570 | 919 | 687-88 | *1512- 13 | 6 Aṅgiras ..... | 13 Pramâthin. .. | | | | | |
| 4615 | 1436 | 1571 | 920 | 688-89 | 1513- 14 | 7 Śrîmukha.. | 14 Vikrama | 6 Bhâdrapada | 9574 | 28.722 | 145 | 0.435 |
| 4616 | 1437 | 1572 | 921 | 689-90 | 1514- 15 | 8 Bhâva..... | 15 Vṛisha [1] | | | | | |
| 4617 | 1438 | 1573 | 922 | 690-91 | 1515- 16 | 9 Yuvan | 17 Subhânu. | | | | | |

[1] Chitrabhânu, No. 16, was suppressed in the north.

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

III. COMMENCEMENT OF THE

| Solar year. | | | | | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Day and Month A. D. | (Time of the Mesha saṅkrânti.) | | | | | | | | | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. | | | | | Kali. |
| | Week day. | By the Ârya Siddhânta. | | | | By the Sûrya Siddhânta. | | | | | | Moon's Age. | | a. | b. | c. | |
| | | Gh. | Pa. | H. | M. | Gh. | Pa. | H. | M. | | | Lunar parts elapsed (t.) | Tithis elapsed. | | | | |
| 13 | 14 | 15 | | 17 | | 15a | | 17a | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 27 Mar. (86).. | 5 Thur... | 38 | 39 | 15 | 27 | 43 | 8 | 17 | 15 | 9 Mar. (68).. | 1 Sun.... | 49 | .147 | 9791 | 161 | 228 | 4585 |
| 26 Mar. (86).. | 6 Fri..... | 54 | 10 | 21 | 40 | 58 | 40 | 23 | 28 | 27 Feb. (58).. | 6 Fri..... | 187 | .561 | 5 | 44 | 200 | 4586 |
| 27 Mar. (86).. | 1 Sun.... | 9 | 41 | 3 | 52 | 14 | 12 | 5 | 41 | 17 Mar. (76).. | 5 Thur... | 162 | .486 | 40 | 980 | 251 | 4587 |
| 27 Mar. (86).. | 2 Mon ... | 25 | 12 | 10 | 5 | 29 | 43 | 11 | 53 | 7 Mar. (66).. | 3 Tues.... | 289 | .867 | 254 | 864 | 223 | 4588 |
| 27 Mar. (86).. | 3 Tues.... | 40 | 44 | 16 | 17 | 45 | 15 | 18 | 6 | 26 Mar. (85).. | 2 Mon.... | 296 | .888 | 269 | 800 | 275 | 4589 |
| 26 Mar. (86).. | 4 Wed.... | 56 | 15 | 22 | 30 | †0 | 46 | †0 | 18 | 14 Mar. (74).. | 6 Fri..... | 194 | .582 | 165 | 647 | 244 | 4590 |
| 27 Mar. (86).. | 6 Fri..... | 11 | 46 | 4 | 42 | 16 | 18 | 6 | 31 | 3 Mar. (62).. | 3 Tues.... | 187 | .561 | 40 | 494 | 213 | 4591 |
| 27 Mar. (86).. | 0 Sat..... | 27 | 17 | 10 | 55 | 31 | 49 | 12 | 44 | 22 Mar. (81).. | 2 Mon.... | 275 | .825 | 75 | 430 | 264 | 4592 |
| 27 Mar. (86).. | 1 Sun.... | 42 | 49 | 17 | 7 | 47 | 21 | 18 | 56 | 11 Mar. (70).. | 6 Fri..... | 229 | .687 | 9951 | 277 | 234 | 4593 |
| 26 Mar. (86).. | 2 Mon.... | 58 | 20 | 23 | 20 | †2 | 52 | †1 | 9 | 28 Feb. (59).. | 3 Tues.... | 68 | .204 | 9826 | 125 | 203 | 4594 |
| 27 Mar. (86).. | 4 Wed.... | 13 | 51 | 5 | 32 | 18 | 24 | 7 | 21 | 18 Mar. (77).. | 2 Mon.... | 54 | .162 | 9861 | 61 | 254 | 4595 |
| 27 Mar. (86).. | 5 Thur... | 29 | 22 | 11 | 45 | 33 | 55 | 13 | 34 | 8 Mar. (67).. | 0 Sat..... | 166 | .498 | 75 | 944 | 226 | 4596 |
| 27 Mar. (86).. | 6 Fri..... | 44 | 54 | 17 | 57 | 49 | 27 | 19 | 47 | 27 Mar. (86).. | 6 Fri..... | 155 | .465 | 110 | 880 | 277 | 4597 |
| 27 Mar. (86).. | 1 Sun.... | 0 | 25 | 0 | 10 | 4 | 58 | 1 | 59 | 16 Mar. (76).. | 4 Wed.... | 324 | .972 | 324 | 704 | 249 | 4598 |
| 27 Mar. (86).. | 2 Mon.... | 15 | 56 | 6 | 22 | 20 | 30 | 8 | 12 | 5 Mar. (64).. | 1 Sun.... | 250 | .750 | 200 | 611 | 218 | 4599 |
| 27 Mar. (86).. | 3 Tues.... | 31 | 27 | 12 | 35 | 36 | 1 | 14 | 25 | 23 Mar. (82).. | 6 Fri..... | 26 | .078 | 9506 | 511 | 267 | 4600 |
| 27 Mar. (86).. | 4 Wed.... | 46 | 59 | 18 | 47 | 51 | 33 | 20 | 37 | 12 Mar. (71).. | 3 Tues.... | 21 | .063 | 9772 | 358 | 236 | 4601 |
| 27 Mar. (87).. | 6 Fri..... | 2 | 30 | 1 | 0 | 7 | 4 | 2 | 50 | 1 Mar. (61).. | 1 Sun.... | 268 | .804 | 9986 | 241 | 208 | 4602 |
| 27 Mar. (86).. | 0 Sat..... | 18 | 1 | 7 | 12 | 22 | 36 | 9 | 2 | 20 Mar. (79).. | 0 Sat..... | 288 | .864 | 21 | 181 | 250 | 4603 |
| 27 Mar. (86).. | 1 Sun.... | 33 | 32 | 13 | 25 | 38 | 7 | 15 | 15 | 9 Mar. (68).. | 4 Wed.... | 61 | .183 | 9696 | 29 | 228 | 4604 |
| 27 Mar. (86).. | 2 Mon.... | 49 | 4 | 19 | 37 | 53 | 39 | 21 | 28 | 27 Feb. (58).. | 2 Mon.... | 180 | .540 | 111 | 912 | 200 | 4605 |
| 27 Mar. (87).. | 4 Wed.... | 4 | 35 | 1 | 50 | 9 | 10 | 3 | 40 | 17 Mar. (77).. | 1 Sun.... | 171 | .513 | 145 | 848 | 252 | 4606 |
| 27 Mar. (86).. | 5 Thur... | 20 | 6 | 8 | 2 | 24 | 42 | 9 | 53 | 6 Mar. (65).. | 5 Thur... | 31 | .093 | 21 | 695 | 221 | 4607 |
| 27 Mar. (86).. | 6 Fri..... | 35 | 37 | 14 | 15 | 40 | 13 | 16 | 5 | 25 Mar. (84).. | 4 Wed.... | 93 | .279 | 56 | 631 | 272 | 4608 |
| 27 Mar. (86).. | 0 Sat..... | 51 | 9 | 20 | 27 | 55 | 45 | 22 | 18 | 14 Mar. (73).. | 1 Sun.... | 90 | .270 | 9931 | 479 | 241 | 4609 |
| 27 Mar. (87).. | 2 Mon.... | 6 | 40 | 2 | 40 | 11 | 17 | 4 | 31 | 2 Mar. (62).. | 5 Thur... | 74 | .222 | 9807 | 326 | 210 | 4610 |
| 27 Mar. (86).. | 3 Tues.... | 22 | 11 | 8 | 52 | 26 | 48 | 10 | 43 | 21 Mar. (80).. | 4 Wed.... | 122 | .366 | 9842 | 262 | 262 | 4611 |
| 27 Mar. (86).. | 4 Wed.... | 37 | 42 | 15 | 5 | 42 | 20 | 16 | 56 | 11 Mar. (70).. | 2 Mon.... | 307 | .921 | 56 | 145 | 234 | 4612 |
| 27 Mar. (86).. | 5 Thur... | 53 | 14 | 21 | 17 | 57 | 51 | 23 | 8 | 28 Feb. (59).. | 0 Fri..... | 68 | .204 | 9932 | 992 | 203 | 4613 |
| 27 Mar. (87).. | 0 Sat..... | 8 | 45 | 3 | 30 | 13 | 23 | 5 | 21 | 18 Mar. (78).. | 5 Thur... | 45 | .135 | 9967 | 928 | 254 | 4614 |
| 27 Mar. (86).. | 1 Sun.... | 24 | 16 | 9 | 42 | 28 | 54 | 11 | 34 | 8 Mar. (67).. | 3 Tues.... | 192 | .576 | 181 | 812 | 226 | 4615 |
| 27 Mar. (86).. | 2 Mon.... | 39 | 47 | 15 | 55 | 44 | 26 | 17 | 46 | 27 Mar. (86).. | 2 Mon.... | 217 | .651 | 216 | 748 | 277 | 4616 |
| 27 Mar. (86).. | 3 Tues.... | 55 | 19 | 22 | 7 | 59 | 57 | 23 | 59 | 16 Mar. (75).. | 0 Fri..... | 152 | .456 | 91 | 595 | 247 | 4617 |

† See footnote p. liii above.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| Kali. | Saka. | Chaitrâdi Vikrama. | Mesbâdi (Solar) year in Bengal. | Kollam. | A. D. | Luni-Solar cycle. (Southern.) | Brihaspati cycle (Northern) current at Mesha sankrânti. | Name of month. | Time of the preceding sankrânti expressed in | | Time of the succeeding sankrânti expressed in | |
| | | | | | | | | | Lunation parts. (t.) | Tithis. | Lunation parts. (t.) | Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4618 | 1439 | 1574 | 923 | 691- 92 | *1516-17 | 10 Dhâtri | 18 Târana | 5 Śrâvaṇa | 9756 | 29.268 | 458 | 1.374 |
| 4619 | 1440 | 1575 | 924 | 692- 93 | 1517-18 | 11 Îśvara | 19 Pârthiva | | | | | |
| 4620 | 1441 | 1576 | 925 | 693- 94 | 1518-19 | 12 Bahudhânya | 20 Vyaya | | | | | |
| 4621 | 1442 | 1577 | 926 | 694- 95 | 1519-20 | 13 Pramâthin | 21 Sarvajit | 3 Jyeshṭha | 9665 | 28.995 | 334 | 1.002 |
| 4622 | 1443 | 1578 | 927 | 695- 96 | *1520-21 | 14 Vikrama | 22 Sarvadhârin | | | | | |
| 4623 | 1444 | 1579 | 928 | 696- 97 | 1521-22 | 15 Vṛisha | 23 Virodhin | 8 Kârttika<br>9 *Mârgaś.(Ksh.)* | 9961<br>12 | 29.883<br>0.036 | 12<br>9911 | 0.036<br>29.733 |
| 4624 | 1445 | 1580 | 929 | 697- 98 | 1522-23 | 16 Chitrabhânu | 24 Vikṛita | 2 Vaiśâkha | 9989 | 29.967 | 558 | 1.674 |
| 4625 | 1446 | 1581 | 930 | 698- 99 | 1523-24 | 17 Subhânu | 25 Khara | | | | | |
| 4626 | 1447 | 1582 | 931 | 699-700 | *1524-25 | 18 Târaṇa | 26 Nandana | 6 Bhâdrapada | 9992 | 29.976 | 616 | 1.848 |
| 4627 | 1448 | 1583 | 932 | 700- 1 | 1525-26 | 19 Pârthiva | 27 Vijaya | | | | | |
| 4628 | 1449 | 1584 | 933 | 701- 2 | 1526-27 | 20 Vyaya | 28 Jaya | | | | | |
| 4629 | 1450 | 1585 | 934 | 702- 3 | 1527-28 | 21 Sarvajit | 29 Manmatha | 4 Âshâḍha | 9818 | 29.454 | 450 | 1.350 |
| 4630 | 1451 | 1586 | 935 | 703- 4 | *1528-29 | 22 Sarvadhârin | 30 Durmukha | | | | | |
| 4631 | 1452 | 1587 | 936 | 704- 5 | 1529-30 | 23 Virodhin | 31 Hemalamba | | | | | |
| 4632 | 1453 | 1588 | 937 | 705- 6 | 1530-31 | 24 Vikṛita | 32 Vilamba | 2 Vaiśâkha | 9517 | 28.551 | 103 | 0.309 |
| 4633 | 1454 | 1589 | 938 | 706- 7 | 1531-32 | 25 Khara | 33 Vikârin | | | | | |
| 4634 | 1455 | 1590 | 939 | 707- 8 | *1532-33 | 26 Nandana | 34 Śârvari | 6 Bhâdrapada | 9532 | 28.596 | 249 | 0.747 |
| 4635 | 1456 | 1591 | 940 | 708- 9 | 1533-34 | 27 Vijaya | 35 Plava | | | | | |
| 4636 | 1457 | 1592 | 941 | 709- 10 | 1534-35 | 28 Jaya | 36 Śubhakṛit | | | | | |
| 4637 | 1458 | 1593 | 942 | 710- 11 | 1535-36 | 29 Manmatha | 37 Śobhana | 5 Śrâvaṇa | 9916 | 29.748 | 519 | 1.557 |
| 4638 | 1459 | 1594 | 943 | 711- 12 | *1536-37 | 30 Durmukha | 38 Krodhin | | | | | |
| 4639 | 1460 | 1595 | 944 | 712- 13 | 1537-38 | 31 Hemalamba | 39 Viśvâvasu | | | | | |
| 4640 | 1461 | 1596 | 945 | 713- 14 | 1538-39 | 32 Vilamba | 40 Parâbhava | 3 Jyeshṭha | 9649 | 28.947 | 408 | 1.224 |
| 4641 | 1462 | 1597 | 946 | 714- 15 | 1539-40 | 33 Vikârin | 41 Plavaṅga | | | | | |
| 4642 | 1463 | 1598 | 947 | 715- 16 | *1540-41 | 34 Śârvari | 42 Kîlaka | 7 Âśvina<br>10 *Pausha (Ksh.)* | 9704<br>96 | 29.112<br>0.288 | 60<br>9948 | 0.180<br>29.844 |
| 4643 | 1464 | 1599 | 948 | 716- 17 | 1541-42 | 35 Plava | 43 Saumya | 1 Chaitra | 9847 | 29.541 | 65 | 0.195 |
| 4644 | 1465 | 1600 | 949 | 717- 18 | 1542-43 | 36 Śubhakṛit | 44 Sâdhâraṇa | | | | | |
| 4645 | 1466 | 1601 | 950 | 718- 19 | 1543-44 | 37 Śobhana | 45 Virodhakṛit | 5 Śrâvaṇa | 9348 | 28.044 | 18 | 0.054 |
| 4646 | 1467 | 1602 | 951 | 719- 20 | *1544-45 | 38 Krodhin | 46 Paridhâvin | | | | | |
| 4647 | 1468 | 1603 | 952 | 720- 21 | 1545-46 | 39 Viśvâvasu | 47 Pramâdin | | | | | |
| 4648 | 1469 | 1604 | 953 | 721- 22 | 1546-47 | 40 Parâbhava | 48 Ânanda | 4 Âshâḍha | 9927 | 29.781 | 637 | 1.911 |

# TABLE I.

(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.

III. COMMENCEMENT OF THE

| Solar year | | | | | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | Kali |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Day and Month A. D. | (Time of the Mesha saṅkrânti.) | | | | | | | | | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain | | | | | |
| | Week day. | By the Ârya Siddhânta. | | | | By the Sûrya Siddhânta. | | | | | | Moon's Age | | a | b | c | |
| | | Gh. | Pa. | H. | M. | Gh. | Pa. | H. | M. | | | Lunar parts elapsed (L.) | Tithis elapsed | | | | |
| 13 | 14 | 15 | | 17 | | 15a | | 17a | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 27 Mar. (87).. | 5 Thur... | 10 | 30 | 4 | 20 | 15 | 29 | 6 | 11 | 4 Mar. (64).. | 3 Tues.... | 158 | 474 | 9967 | 442 | 216 | 4618 |
| 27 Mar. (86).. | 6 Fri..... | 26 | 21 | 10 | 32 | 31 | 0 | 12 | 24 | 23 Mar. (82).. | 2 Mon.... | 239 | 717 | 2 | 378 | 267 | 4619 |
| 27 Mar. (86).. | 0 Sat..... | 41 | 52 | 16 | 45 | 46 | 32 | 18 | 37 | 12 Mar. (71).. | 6 Fri..... | 155 | 465 | 9877 | 226 | 236 | 4620 |
| 27 Mar. (86).. | 1 Sun.... | 57 | 24 | 22 | 57 | †2 | 3 | †0 | 40 | 2 Mar. (61).. | 4 Wed.... | 323 | 969 | 92 | 109 | 208 | 4621 |
| 27 Mar. (87).. | 3 Tues.... | 12 | 55 | 5 | 10 | 17 | 35 | 7 | 2 | 20 Mar. (80).. | 3 Tues... | 306 | 918 | 126 | 45 | 259 | 4622 |
| 27 Mar. (86).. | 4 Wed.... | 28 | 26 | 11 | 22 | 33 | 6 | 13 | 15 | 9 Mar. (68).. | 0 Sat..... | 53 | 159 | 2 | 892 | 229 | 4623 |
| 27 Mar. (86).. | 5 Thur... | 43 | 57 | 17 | 35 | 48 | 38 | 19 | 27 | 27 Feb. (58).. | 5 Thur... | 221 | 663 | 216 | 776 | 201 | 4624 |
| 27 Mar. (86).. | 6 Fri..... | 59 | 29 | 23 | 47 | †4 | 9 | †1 | 40 | 18 Mar. (77).. | 4 Wed.... | 255 | 765 | 251 | 712 | 252 | 4625 |
| 27 Mar. (87).. | 1 Sun.... | 15 | 0 | 6 | 0 | 19 | 41 | 7 | 52 | 6 Mar. (66).. | 1 Sun.... | 217 | 651 | 127 | 559 | 221 | 4626 |
| 27 Mar. (86).. | 2 Mon.... | 30 | 31 | 12 | 12 | 35 | 12 | 14 | 5 | 25 Mar. (84).. | 0 Sat..... | 306 | 918 | 161 | 495 | 272 | 4627 |
| 27 Mar. (86).. | 3 Tues.... | 46 | 2 | 18 | 25 | 50 | 44 | 20 | 18 | 14 Mar. (73).. | 4 Wed.... | 294 | 882 | 37 | 342 | 241 | 4628 |
| 28 Mar. (87).. | 5 Thur... | 1 | 34 | 0 | 37 | †6 | 15 | 2 | 30 | 3 Mar. (62).. | 1 Sun..... | 185 | 555 | 9913 | 189 | 211 | 4629 |
| 27 Mar. (87).. | 6 Fri..... | 17 | 5 | 6 | 50 | 21 | 47 | 8 | 43 | 21 Mar. (81).. | 0 Sat..... | 187 | 561 | 9947 | 125 | 262 | 4630 |
| 27 Mar. (86).. | 0 Sat..... | 32 | 36 | 13 | 2 | 37 | 19 | 14 | 55 | 11 Mar. (70).. | 5 Thur... | 310 | 930 | 162 | 9 | 234 | 4631 |
| 27 Mar. (86).. | 1 Sun.... | 48 | 7 | 19 | 15 | 52 | 50 | 21 | 8 | 28 Feb. (59).. | 2 Mon.... | 70 | 210 | 37 | 856 | 203 | 4632 |
| 28 Mar. (87).. | 3 Tues.... | 3 | 39 | 1 | 27 | 8 | 22 | 3 | 21 | 19 Mar. (78).. | 1 Sun.... | 77 | 231 | 72 | 792 | 254 | 4633 |
| 27 Mar. (87).. | 4 Wed.... | 19 | 10 | 7 | 40 | 23 | 53 | 9 | 33 | 8 Mar. (68).. | 6 Fri..... | 301 | 903 | 286 | 675 | 226 | 4634 |
| 27 Mar. (86).. | 5 Thur... | 34 | 41 | 13 | 52 | 39 | 25 | 15 | 46 | 26 Mar. (85).. | 4 Wed.... | 58 | 174 | 9982 | 575 | 275 | 4635 |
| 27 Mar. (86).. | 6 Fri..... | 50 | 12 | 20 | 5 | 54 | 56 | 21 | 58 | 15 Mar. (74).. | 1 Sun.... | 64 | 192 | 9858 | 422 | 244 | 4636 |
| 28 Mar. (87).. | 1 Sun.... | 5 | 44 | 2 | 17 | 10 | 28 | 4 | 11 | 4 Mar. (63).. | 5 Thur... | 15 | 045 | 9734 | 270 | 213 | 4637 |
| 27 Mar. (87).. | 2 Mon.... | 21 | 15 | 8 | 30 | 25 | 59 | 10 | 24 | 22 Mar. (82).. | 4 Wed.... | 44 | 132 | 9769 | 206 | 265 | 4638 |
| 27 Mar. (86).. | 3 Tues.... | 36 | 46 | 14 | 42 | 41 | 31 | 16 | 36 | 12 Mar. (71).. | 2 Mon.... | 197 | 591 | 9983 | 89 | 236 | 4639 |
| 27 Mar. (86).. | 4 Wed.... | 52 | 17 | 20 | 55 | 57 | 2 | 22 | 49 | 2 Mar. (61).. | 0 Sat..... | 315 | 945 | 197 | 973 | 208 | 4640 |
| 28 Mar. (87).. | 6 Fri..... | 7 | 49 | 3 | 7 | 12 | 34 | 3 | 2 | 21 Mar. (80).. | 6 Fri..... | 296 | 888 | 232 | 909 | 260 | 4641 |
| 27 Mar. (87).. | 0 Sat..... | 23 | 20 | 9 | 20 | 28 | 5 | 11 | 14 | 9 Mar. (69).. | 3 Tues.... | 108 | 324 | 108 | 756 | 229 | 4642 |
| 27 Mar. (86).. | 1 Sun.... | 38 | 51 | 15 | 32 | 43 | 37 | 17 | 27 | 26 Feb. (57).. | 0 Sat..... | 41 | 123 | 9983 | 603 | 198 | 4643 |
| 27 Mar. (86).. | 2 Mon.... | 54 | 22 | 21 | 45 | 59 | 8 | 23 | 39 | 17 Mar. (76).. | 6 Fri..... | 124 | 372 | 18 | 539 | 249 | 4644 |
| 28 Mar. (87).. | 4 Wed.... | 9 | 54 | 3 | 57 | 14 | 40 | 5 | 52 | 6 Mar. (65).. | 3 Tues.... | 127 | 381 | 9894 | 386 | 218 | 4645 |
| 27 Mar. (87).. | 5 Thur... | 25 | 25 | 10 | 10 | 30 | 11 | 12 | 5 | 24 Mar. (84).. | 2 Mon.... | 194 | 582 | 9928 | 322 | 270 | 4646 |
| 27 Mar. (86).. | 6 Fri..... | 40 | 56 | 16 | 22 | 45 | 43 | 18 | 17 | 13 Mar. (72).. | 6 Fri..... | 67 | 201 | 9804 | 169 | 239 | 4647 |
| 27 Mar. (86).. | 0 Sat..... | 56 | 27 | 22 | 35 | †1 | 14 | †0 | 30 | 3 Mar. (62).. | 4 Wed.... | 206 | 618 | 18 | 53 | 211 | 4648 |

† See footnote p. liii above.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| Kali. | Śaka. | Chaitrâdi. Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | Luni-Solar cycle. (Southern.) | Brihaspati cycle (Northern) current at Mesha sankrânti. | Name of month. | Time of the preceding sankrânti expressed in Lunation parts. (*l.*) | Time of the preceding sankrânti expressed in Tithis. | Time of the succeeding sankrânti expressed in Lunation parts. (*l.*) | Time of the succeeding sankrânti expressed in Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4649 | 1470 | 1605 | 954 | 722-23 | 1547-48 | 41 Plavanga...... | 49 Râkshasa..... | ............ | ...... | ...... | ...... | ...... |
| 4650 | 1471 | 1606 | 955 | 723-24 | *1548-49 | 42 Kîlaka........ | 50 Anala....... | ............ | ...... | ...... | ...... | ...... |
| 4651 | 1472 | 1607 | 956 | 724-25 | 1549-50 | 43 Saumya....... | 51 Pingala...... | 2 Vaiśâkha... | 9659 | 28.977 | 75 | 0.225 |
| 4652 | 1473 | 1608 | 957 | 725-26 | 1550-51 | 44 Sâdhârana.... | 52 Kâlayukta.... | ............ | ...... | ...... | ...... | ...... |
| 4653 | 1474 | 1609 | 958 | 726-27 | 1551-52 | 45 Virodhakṛit... | 53 Siddhârthin... | 6 Bhâdrapada.. | 9533 | 28.599 | 121 | 0.363 |
| 4654 | 1475 | 1610 | 959 | 727-28 | *1552-53 | 46 Paridhâvin... | 54 Raudra...... | ............ | ...... | ...... | ...... | ...... |
| 4655 | 1476 | 1611 | 960 | 728-29 | 1553-54 | 47 Pramâdin.... | 55 Durmati...... | ............ | ...... | ...... | ...... | ...... |
| 4656 | 1477 | 1612 | 961 | 729-30 | 1554-55 | 48 Ânanda...... | 56 Dundubhi.... | 4 Âshâḍha.... | 9435 | 28.305 | 115 | 0.345 |
| 4657 | 1478 | 1613 | 962 | 730-31 | 1555-56 | 49 Râkshasa.... | 57 Rudhirodgârin | ............ | ...... | ...... | ...... | ...... |
| 4658 | 1479 | 1614 | 963 | 731-32 | *1556-57 | 50 Anala ...... | 58 Raktâksha.... | ............ | ...... | ...... | ...... | ...... |
| 4659 | 1480 | 1615 | 964 | 732-33 | 1557-58 | 51 Pingala...... | 59 Krodhana.... | 3 Jyeshṭha.... | 9611 | 28.833 | 394 | 1.182 |
| 4660 | 1481 | 1616 | 965 | 733-34 | 1558-59 | 52 Kâlayukta.... | 60 Kshaya...... | ............ | ...... | ...... | ...... | ...... |
| 4661 | 1482 | 1617 | 966 | 734-35 | 1559-60 | 53 Siddhârthin... | 1 Prabhava..... | 7 Âśvina...... | 9864 | 29.592 | 63 | 0.189 |
| 4662 | 1483 | 1618 | 967 | 735-36 | *1560-61 | 54 Raudra...... | 2 Vibhava...... | ............ | ...... | ...... | ...... | ...... |
| 4663 | 1484 | 1619 | 968 | 736-37 | 1561-62 | 55 Durmati..... | 3 Śukla........ | ............ | ...... | ...... | ...... | ...... |
| 4664 | 1485 | 1620 | 969 | 737-38 | 1562-63 | 56 Dundubhi.... | 4 Pramoda..... | 5 Śrâvana..... | 9580 | 28.740 | 147 | 0.441 |
| 4665 | 1486 | 1621 | 970 | 738-39 | 1563-64 | 57 Rudhirodgârin | 5 Prajâpati..... | ............ | ...... | ...... | ...... | ...... |
| 4666 | 1487 | 1622 | 971 | 739-40 | *1564-65 | 58 Raktâksha.... | 6 Angiras...... | ............ | ...... | ...... | ...... | ...... |
| 4667 | 1488 | 1623 | 972 | 740-41 | 1565-66 | 59 Krodhana.... | 7 Śrîmukha.... | 4 Âshâḍha.... | 9938 | 29.814 | 753 | 2.259 |
| 4668 | 1489 | 1624 | 973 | 741-42 | 1566-67 | 60 Kshaya...... | 8 Bhâva...... | ............ | ...... | ...... | ...... | ...... |
| 4669 | 1490 | 1625 | 974 | 742-43 | 1567-68 | 1 Prabhava..... | 9 Yuvan....... | ............ | ...... | ...... | ...... | ...... |
| 4670 | 1491 | 1626 | 975 | 743-44 | *1568-69 | 2 Vibhava...... | 10 Dhâtṛi...... | 2 Vaiśâkha.... | 9671 | 29.013 | 129 | 0.387 |
| 4671 | 1492 | 1627 | 976 | 744-45 | 1569-70 | 3 Śukla........ | 11 Îśvara....... | ............ | ...... | ...... | ...... | ...... |
| 4672 | 1493 | 1628 | 977 | 745-46 | 1570-71 | 4 Pramoda..... | 12 Bahudhânya.. | 6 Bhâdrapada.. | 9628 | 28.884 | 126 | 0.378 |
| 4673 | 1494 | 1629 | 978 | 746-47 | 1571-72 | 5 Prajâpati..... | 13 Pramâthin... | ............ | ...... | ...... | ...... | ...... |
| 4674 | 1495 | 1630 | 979 | 747-48 | *1572-73 | 6 Angiras...... | 14 Vikrama.... | ............ | ...... | ...... | ...... | ...... |
| 4675 | 1496 | 1631 | 980 | 748-49 | 1573-74 | 7 Śrîmukha | 15 Vṛisha....... | 4 Âshâḍha .... | 9477 | 28.431 | 258 | 0.774 |
| 4676 | 1497 | 1632 | 981 | 749-50 | 1574-75 | 8 Bhâva | 16 Chitrabhânu | | | | | |
| 4677 | 1498 | 1633 | 982 | 750-51 | 1575-76 | 9 Yuvan....... | 17 Subhânu..... | ...... | | | | |
| 4678 | 1499 | 1634 | 983 | 751-52 | *1576-77 | 10 Dhâtṛi...... | 18 Târana...... | 3 Jyeshṭha.. | 9631 | 28.893 | 352 | 1.056 |
| 4679 | 1500 | 1635 | 984 | 752-53 | 1577-78 | 11 Îśvara....... | 19 Pârthiva..... | ............ | ...... | ...... | ...... | ...... |
| 4680 | 1501 | 1636 | 985 | 753-54 | 1578-79 | 12 Bahudhânya.. | 20 Vyaya....... | 7 Âśvina..... | 9645 | 28.935 | 19 | 0.057 |
| 4681 | 1502 | 1637 | 986 | 754-55 | 1579-80 | 13 Pramâthin... | 21 Sarvajit..... | ............ | ...... | ...... | ...... | ...... |

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

| III. COMMENCEMENT OF THE | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Solar year. | | | | | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | Kali. |
| Day and Month A. D. | (Time of the Mesha saṁkrânti.) | | | | | | | | | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain | | | | | |
| | Week day. | By the Ârya Siddhânta. | | | | By the Sûrya Siddhânta. | | | | | | Moon's Age. | | a. | b. | c. | |
| | | Gh. | Pa. | H. | M. | Gh. | Pa. | H. | M. | | | Lunar parts elapsed (t.) | Tithis elapsed | | | | |
| 13 | 14 | 15 | | 17 | | 15a | | 17a | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 26 Mar. (87).. | 2 Mon.... | 11 | 59 | 4 | 47 | 16 | 46 | 6 | 42 | 22 Mar. (81).. | 3 Tues.... | 183 | .549 | 53 | 989 | 262 | 4649 |
| 27 Mar. (87).. | 3 Tues.... | 27 | 30 | 11 | 0 | 32 | 17 | 12 | 55 | 11 Mar. (71).. | 1 Sun. | 306 | .918 | 267 | 872 | 234 | 4650 |
| 27 Mar. (86).. | 4 Wed.... | 43 | 1 | 17 | 12 | 47 | 49 | 19 | 8 | 28 Feb. (59).. | 5 Thur... | 149 | .447 | 143 | 720 | 203 | 4651 |
| 27 Mar. (86).. | 5 Thur... | 58 | 32 | 23 | 25 | †3 | 21 | †1 | 20 | 19 Mar. (78).. | 4 Wed.... | 202 | .606 | 178 | 656 | 253 | 4652 |
| 28 Mar. (87).. | 0 Sat..... | 14 | 4 | 5 | 37 | 18 | 52 | 7 | 33 | 8 Mar. (67).. | 1 Sun. | 191 | .573 | 53 | 503 | 224 | 4653 |
| 27 Mar. (87).. | 1 Sun.... | 29 | 35 | 11 | 50 | 34 | 24 | 13 | 45 | 26 Mar. (86).. | 0 Sat..... | 281 | .843 | 88 | 439 | 275 | 4654 |
| 27 Mar. (86).. | 2 Mon. | 45 | 6 | 18 | 2 | 49 | 55 | 19 | 58 | 15 Mar. (74).. | 4 Wed.... | 240 | .720 | 9964 | 286 | 244 | 4655 |
| 28 Mar. (87).. | 4 Wed. .. | 0 | 37 | 0 | 15 | 5 | 27 | 2 | 11 | 4 Mar. (63).. | 1 Sun.... | 86 | .258 | 9840 | 133 | 214 | 4656 |
| 28 Mar. (87).. | 5 Thur... | 16 | 9 | 6 | 27 | 20 | 58 | 8 | 23 | 23 Mar. (82).. | 0 Sat..... | 73 | .219 | 9874 | 69 | 265 | 4657 |
| 27 Mar. (87).. | 6 Fri..... | 31 | 40 | 12 | 40 | 36 | 30 | 14 | 36 | 12 Mar. (72).. | 5 Thur... | 188 | .564 | 89 | 953 | 237 | 4658 |
| 27 Mar. (86).. | 0 Sat..... | 47 | 11 | 18 | 52 | 52 | 1 | 20 | 48 | 2 Mar. (61).. | 3 Tues... | 325 | .975 | 303 | 836 | 209 | 4659 |
| 28 Mar. (87) | 2 Mon.... | 2 | 42 | 1 | 5 | 7 | 33 | 3 | 1 | 20 Mar. (79).. | 1 Sun.... | ⊙ −1 | −.003 | 9999 | 736 | 257 | 4660 |
| 28 Mar. (87).. | 3 Tues. .. | 18 | 14 | 7 | 17 | 23 | 4 | 9 | 14 | 10 Mar. (69).. | 6 Fri. | 258 | .774 | 213 | 619 | 229 | 4661 |
| 27 Mar. (87).. | 4 Wed. .. | 33 | 45 | 13 | 30 | 38 | 36 | 15 | 26 | 27 Mar. (87).. | 4 Wed.... | 33 | .099 | 9909 | 519 | 278 | 4662 |
| 27 Mar. (86).. | 5 Thur.... | 49 | 16 | 19 | 42 | 54 | 7 | 21 | 39 | 16 Mar. (75).. | 1 Sun. | 29 | .087 | 9785 | 366 | 247 | 4663 |
| 28 Mar. (87).. | 0 Sat..... | 4 | 47 | 1 | 55 | 9 | 39 | 3 | 52 | 6 Mar. (65).. | 6 Fri. | 280 | .840 | 9999 | 250 | 219 | 4664 |
| 28 Mar. (87).. | 1 Sun.... | 20 | 19 | 8 | 7 | 25 | 10 | 10 | 4 | 25 Mar. (84).. | 5 Thur... | 303 | .909 | 34 | 186 | 270 | 4665 |
| 27 Mar. (87).. | 2 Mon. | 35 | 50 | 14 | 20 | 40 | 42 | 16 | 17 | 13 Mar. (72).. | 2 Mon... | 79 | .237 | 9910 | 33 | 239 | 4666 |
| 27 Mar. (86).. | 3 Tues. .. | 51 | 21 | 20 | 32 | 56 | 13 | 22 | 29 | 3 Mar. (62).. | 0 Sat..... | 196 | .588 | 124 | 917 | 211 | 4667 |
| 28 Mar. (87).. | 5 Thur... | 6 | 52 | 2 | 45 | 11 | 45 | 4 | 42 | 22 Mar. (81).. | 6 Fri. | 287 | .861 | 159 | 852 | 262 | 4668 |
| 28 Mar. (87).. | 6 Fri. .. | 22 | 24 | 8 | 57 | 27 | 16 | 10 | 55 | 11 Mar. (70).. | 3 Tues.. | 41 | .123 | 34 | 700 | 232 | 4669 |
| 27 Mar. (87).. | 0 Sat.. .. | 37 | 55 | 15 | 10 | 42 | 48 | 17 | 7 | 28 Feb. (59).. | 0 Sat. | 12 | .036 | 9910 | 547 | 201 | 4670 |
| 27 Mar. (86).. | 1 Sun.... | 53 | 26 | 21 | 22 | 58 | 19 | 23 | 20 | 18 Mar. (77).. | 6 Fri.. | 101 | .303 | 9945 | 483 | 252 | 4671 |
| 28 Mar. (87).. | 3 Tues.... | 8 | 57 | 3 | 35 | 13 | 51 | 5 | 32 | 7 Mar. (66).. | 3 Tues.... | 84 | .252 | 9820 | 330 | 221 | 4672 |
| 28 Mar. (87).. | 4 Wed.... | 24 | 29 | 9 | 47 | 29 | 22 | 11 | 45 | 26 Mar. (85).. | 2 Mon. .. | 134 | .402 | 9855 | 266 | 273 | 4673 |
| 27 Mar. (87) .. | 5 Thur... | 40 | 0 | 16 | 0 | 44 | 54 | 17 | 58 | 15 Mar. (75).. | 0 Sat..... | 322 | .966 | 69 | 150 | 245 | 4674 |
| 27 Mar. (86).. | 6 Fri..... | 55 | 31 | 22 | 12 | †0 | 26 | †0 | 10 | 4 Mar. (63).. | 4 Wed ... | 84 | .252 | 9945 | 997 | 214 | 4675 |
| 28 Mar. (87). | 1 Sun ... | 11 | 2 | 4 | 25 | 15 | 57 | 6 | 23 | 23 Mar. (82).. | 3 Tues.. . | 62 | .186 | 9980 | 933 | 265 | 4676 |
| 28 Mar. (87).. | 2 Mon.... | 26 | 34 | 10 | 37 | 31 | 29 | 12 | 35 | 13 Mar. (72).. | 1 Sun .... | 206 | .618 | 194 | 816 | 237 | 4677 |
| 27 Mar. (87).. | 3 Tues.... | 42 | 5 | 16 | 50 | 47 | 0 | 18 | 48 | 1 Mar. (61).. | 5 Thur.... | 92 | .276 | 70 | 664 | 205 | 4678 |
| 27 Mar. (86).. | 4 Wed .. | 57 | 36 | 23 | 2 | †2 | 32 | †1 | 1 | 20 Mar. (79).. | 4 Wed. | 162 | .486 | 105 | 600 | 257 | 4679 |
| 28 Mar. (87).. | 6 Fri... | 13 | 7 | 5 | 15 | 18 | 3 | 7 | 13 | 9 Mar. (68).. | 1 Sun.... | 166 | .498 | 9980 | 447 | 227 | 4680 |
| 28 Mar. (87). | 0 Sat ... | 28 | 39 | 11 | 27 | 33 | 35 | 13 | 26 | 28 Mar. (87).. | 0 Sat .... | 250 | .750 | 15 | 393 | 278 | 4681 |

† See footnote p. liii above. ⊙ See Text, Art. 101 above, para. 2.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| Kali. | Saka. | Chaitrâdi. Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | Luni-Solar cycle (Southern.) | Brihaspati cycle (Northern) current at Mesha saṅkrânti. | Name of month. | Time of the preceding saṅkrânti expressed in: Lunation parts. (t.) | Time of the preceding saṅkrânti expressed in: Tithis. | Time of the succeeding saṅkrânti expressed in: Lunation parts. (t.) | Time of the succeeding saṅkrânti expressed in: Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4682 | 1503 | 1638 | 987 | 755-56 | *1580- 81 | 14 Vikrama | 22 Sarvadhârin. | | | | | |
| 4683 | 1504 | 1639 | 988 | 756-57 | 1581- 82 | 15 Vrisha | 23 Virodhin. | 5 Srâvana | 9752 | 29.256 | 347 | 1.041 |
| 4684 | 1505 | 1640 | 989 | 757-58 | 1582- 83 | 16 Chitrabhânu. | 24 Vikrita. | | | | | |
| 4685 | 1506 | 1641 | 990 | 758-59 | 1583- 84 | 17 Subhânu. | 25 Khara | | | | | |
| 4686 | 1507 | 1642 | 991 | 759-60 | *1584- 85 | 18 Târana | 26 Nandana | 4 Âshâḍha | 9894 | 29.682 | 772 | 2.316 |
| 4687 | 1508 | 1643 | 992 | 760-61 | 1585- 86 | 19 Pârthiva | 27 Vijaya | | | | | |
| 4688 | 1509 | 1644 | 993 | 761-62 | 1586- 87 | 20 Vyaya | 28 Jaya. | | | | | |
| 4689 | 1510 | 1645 | 994 | 762-63 | 1587- 88 | 21 Sarvajit | 29 Manmatha | 2 Vaiśâkha | 9894 | 29.682 | 280 | 0.840 |
| 4690 | 1511 | 1646 | 995 | 763-64 | *1588- 89 | 22 Sarvadhârin | 30 Durmukha. | | | | | |
| 4691 | 1512 | 1647 | 996 | 764-65 | 1589- 90 | 23 Virodhin | 31 Hemalamba | 6 Bhâdrapada | 9806 | 29.418 | 233 | 0.699 |
| 4692 | 1513 | 1648 | 997 | 765-66 | 1590- 91 | 24 Vikrita | 32 Vilamba. | | | | | |
| 4693 | 1514 | 1649 | 998 | 766-67 | 1591- 92 | 25 Khara | 33 Vikârin | | | | | |
| 4694 | 1515 | 1650 | 999 | 767-68 | *1592- 93 | 26 Nandana | 34 Śârvari | 4 Âshâḍha | 9443 | 28.329 | 307 | 0.921 |
| 4695 | 1516 | 1651 | 1000 | 768-69 | 1593- 94 | 27 Vijaya | 35 Plava | | | | | |
| 4696 | 1517 | 1652 | 1001 | 769-70 | 1594- 95 | 28 Jaya. | 36 Śubhakrit. | | | | | |
| 4697 | 1518 | 1653 | 1002 | 770-71 | 1595- 96 | 29 Manmatha | 37 Sobhana. | 3 Jyeshṭha | 9753 | 29.259 | 375 | 1.125 |
| 4698 | 1519 | 1654 | 1003 | 771-72 | *1596- 97 | 30 Durmukha | 38 Krodhin | | | | | |
| 4699 | 1520 | 1655 | 1004 | 772-73 | 1597- 98 | 31 Hemalamba | 39 Viśvâvasu | 7 Âśvina | 9728 | 29.184 | 21 | 0.063 |
| 4700 | 1521 | 1656 | 1005 | 773-74 | 1598- 99 | 32 Vilamba | 40 Parâbhava. | | | | | |
| 4701 | 1522 | 1657 | 1006 | 774-75 | 1599-600 | 33 Vikârin | 41 Plavanga | | | | | |
| 4702 | 1523 | 1658 | 1007 | 775-76 | *1600- 1 | 34 Śârvari | 42 Kîlaka 1) | 5 Śrâvana | 9934 | 29.802 | 515 | 1.545 |
| 4703 | 1524 | 1659 | 1008 | 776-77 | 1601- 2 | 35 Plava. | 44 Sâdhârana | | | | | |
| 4704 | 1525 | 1660 | 1009 | 777-78 | 1602- 3 | 36 Subhakrit | 45 Virodhakrit | | | | | |
| 4705 | 1526 | 1661 | 1010 | 778-79 | 1603- 4 | 37 Sobhana | 46 Paridhâvin | 4 Âshâḍha | 9907 | 29.721 | 731 | 2.193 |
| 4706 | 1527 | 1662 | 1011 | 779-80 | *1604- 5 | 38 Krodhin | 47 Pramâdin | | | | | |
| 4707 | 1528 | 1663 | 1012 | 780-81 | 1605- 6 | 39 Viśvâvasu | 48 Ânanda. | | | | | |
| 4708 | 1529 | 1664 | 1013 | 781-82 | 1606- 7 | 40 Parâbhava | 49 Râkshasa. | 1 Chaitra | 9789 | 29.367 | 60 | 0.180 |
| 4709 | 1530 | 1665 | 1014 | 782-83 | 1607- 8 | 41 Plavanga | 50 Anala | | | | | |
| 4710 | 1531 | 1666 | 1015 | 783-84 | *1608- 9 | 42 Kîlaka | 51 Pingala | 6 Bhâdrapada | 9997 | 29.991 | 415 | 1.245 |
| 4711 | 1532 | 1667 | 1016 | 784-85 | 1609- 10 | 43 Saumya. | 52 Kâlayukta | | | | | |
| 4712 | 1533 | 1668 | 1017 | 785-86 | 1610- 11 | 44 Sâdhârana | 53 Siddhârthin | | | | | |
| 4713 | 1534 | 1669 | 1018 | 786-87 | 1611- 12 | 45 Virodhakrit | 54 Raudra | 4 Âshâḍha | 9417 | 28.251 | 287 | 0.861 |
| 4714 | 1535 | 1670 | 1019 | 787-88 | *1612- 13 | 46 Paridhâvin | 55 Durmati | | | | | |

1) Saumya No. 43 was suppressed in the north.

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

| III COMMENCEMENT OF THE | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Solar year. | | | | | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | | | |
| Day and Month A. D. | (Time of the Mesha saṅkrânti.) Week day. | By the Ârya Siddhânta. Gh. | Pa. | H. | M. | By the Sûrya Siddhânta. Gh. | Pa. | H. | M. | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. Moon's Age. Lunation parts elapsed. (t.) | Tithis elapsed. | a. | b. | c. | | | Kali. |
| 13 | 14 | 15 | | 17 | | 15a | | 17a | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | | | 1 |
| 27 Mar. (87).. | 1 Sun.... | 44 | 10 | 17 | 40 | 49 | 6 | 19 | 38 | 16 Mar. (76).. | 4 Wed.. | 169 | .507 | 9890 | 230 | 247 | | | 4682 |
| 27 Mar. (86).. | 2 Mon.... | 59 | 41 | 23 | 52 | †4 | 38 | †1 | 51 | 5 Mar. (64).. | 1 Sun.... | ⊙—27 | —.081 | 9766 | 77 | 216 | | | 4683 |
| 28 Mar. (87).. | 4 Wed.... | 15 | 12 | 6 | 5 | 20 | 9 | 8 | 4 | 25 Mar. (84).. | 1 Sun.... | 322 | .966 | 139 | 49 | 270 | | | 4684 |
| 28 Mar. (87).. | 5 Thur.... | 30 | 44 | 12 | 17 | 35 | 41 | 14 | 16 | 14 Mar. (73).. | 5 Thur.... | 70 | .210 | 15 | 897 | 239 | | | 4685 |
| 27 Mar. (87).. | 6 Fri..... | 46 | 15 | 18 | 30 | 51 | 12 | 20 | 29 | 3 Mar. (62).. | 3 Tues.... | 235 | .705 | 280 | 780 | 211 | | | 4686 |
| 28 Mar. (87).. | 1 Sun.... | 1 | 46 | 0 | 42 | 6 | 44 | 2 | 42 | 22 Mar. (81).. | 2 Mon.... | 267 | .801 | 264 | 716 | 263 | | | 4687 |
| 28 Mar. (87).. | 2 Mon.... | 17 | 17 | 6 | 55 | 22 | 15 | 8 | 54 | 11 Mar. (70).. | 6 Fri..... | 226 | .678 | 140 | 563 | 232 | | | 4688 |
| 28 Mar. (87).. | 3 Tues.... | 32 | 49 | 13 | 7 | 37 | 47 | 15 | 7 | 28 Feb. (59).. | 3 Tues.... | 233 | .699 | 16 | 411 | 201 | | | 4689 |
| 27 Mar. (87).. | 4 Wed.... | 48 | 20 | 19 | 20 | 53 | 18 | 21 | 19 | 18 Mar. (78).. | 2 Mon.... | 305 | .915 | 50 | 347 | 252 | | | 4690 |
| 28 Mar. (87).. | 6 Fri..... | 3 | 51 | 1 | 32 | 8 | 50 | 3 | 32 | 7 Mar. (66).. | 6 Fri..... | 198 | .594 | 9926 | 194 | 222 | | | 4691 |
| 28 Mar. (87).. | 0 Sat..... | 19 | 22 | 7 | 45 | 24 | 21 | 9 | 45 | 26 Mar. (85).. | 5 Thur.... | 203 | .609 | 9961 | 130 | 273 | | | 4692 |
| 28 Mar. (87).. | 1 Sun.... | 34 | 54 | 13 | 57 | 39 | 53 | 15 | 57 | 16 Mar. (75).. | 3 Tues.... | 327 | .981 | 175 | 13 | 245 | | | 4693 |
| 27 Mar. (87).. | 2 Mon.... | 50 | 25 | 20 | 10 | 55 | 25 | 22 | 10 | 4 Mar. (64).. | 0 Sat..... | 85 | .255 | 51 | 860 | 214 | | | 4694 |
| 28 Mar. (87).. | 4 Wed.... | 5 | 56 | 2 | 22 | 10 | 56 | 4 | 22 | 23 Mar. (82).. | 6 Fri..... | 91 | .273 | 85 | 796 | 265 | | | 4695 |
| 28 Mar. (87).. | 5 Thur.... | 21 | 27 | 8 | 35 | 26 | 28 | 10 | 35 | 13 Mar. (72).. | 4 Wed.... | 313 | .939 | 300 | 680 | 237 | | | 4696 |
| 28 Mar. (87).. | 6 Fri..... | 36 | 59 | 14 | 47 | 41 | 59 | 16 | 48 | 2 Mar. (61).. | 1 Sun.... | 293 | .879 | 175 | 527 | 206 | | | 4697 |
| 27 Mar. (87).. | 0 Sat..... | 52 | 30 | 21 | 0 | 57 | 31 | 23 | 0 | 19 Mar. (79).. | 6 Fri..... | 73 | .219 | 9871 | 427 | 255 | | | 4698 |
| 28 Mar. (87).. | 2 Mon.... | 8 | 1 | 3 | 12 | 13 | 2 | 5 | 13 | 8 Mar. (67).. | 3 Tues.... | 26 | .078 | 9747 | 274 | 224 | | | 4699 |
| 28 Mar. (87).. | 3 Tues.... | 23 | 32 | 9 | 25 | 28 | 34 | 11 | 25 | 27 Mar. (86).. | 2 Mon.... | 59 | .177 | 9782 | 210 | 275 | | | 4700 |
| 28 Mar. (87).. | 4 Wed.... | 39 | 4 | 15 | 37 | 44 | 5 | 17 | 38 | 17 Mar. (76).. | 0 Sat..... | 214 | .642 | 9996 | 94 | 247 | | | 4701 |
| 27 Mar. (87).. | 5 Thur.... | 54 | 35 | 21 | 50 | 59 | 37 | 23 | 51 | 6 Mar. (65).. | 5 Thur.... | 331 | .993 | 210 | 977 | 219 | | | 4702 |
| 28 Mar. (87).. | 0 Sat..... | 10 | 6 | 4 | 2 | 15 | 8 | 6 | 3 | 25 Mar. (84).. | 4 Wed.... | 312 | .936 | 245 | 913 | 271 | | | 4703 |
| 28 Mar. (87).. | 1 Sun.... | 25 | 37 | 10 | 15 | 30 | 40 | 12 | 16 | 14 Mar. (73).. | 1 Sun.... | 121 | .363 | 121 | 760 | 240 | | | 4704 |
| 28 Mar. (87).. | 2 Mon.... | 41 | 9 | 16 | 27 | 46 | 11 | 18 | 29 | 3 Mar. (62).. | 5 Thur.... | 51 | .153 | 9997 | 607 | 209 | | | 4705 |
| 27 Mar. (87).. | 3 Tues.... | 56 | 40 | 22 | 40 | †1 | 43 | †0 | 41 | 21 Mar. (81).. | 4 Wed.... | 133 | .399 | 31 | 543 | 260 | | | 4706 |
| 28 Mar. (87).. | 5 Thur.... | 12 | 11 | 4 | 52 | 17 | 14 | 6 | 54 | 10 Mar. (69).. | 1 Sun.... | 136 | .408 | 9907 | 391 | 229 | | | 4707 |
| 28 Mar. (87).. | 6 Fri..... | 27 | 42 | 11 | 5 | 32 | 46 | 13 | 6 | 27 Feb. (58).. | 5 Thur.... | 66 | .198 | 9783 | 238 | 199 | | | 4708 |
| 28 Mar. (87).. | 0 Sat..... | 43 | 14 | 17 | 17 | 48 | 17 | 19 | 19 | 18 Mar. (77).. | 4 Wed.... | 82 | .246 | 9817 | 174 | 250 | | | 4709 |
| 27 Mar. (87).. | 1 Sun.... | 58 | 45 | 23 | 30 | †3 | 49 | †1 | 32 | 7 Mar. (67).. | 2 Mon.... | 223 | .669 | 32 | 57 | 222 | | | 4710 |
| 28 Mar. (87).. | 3 Tues.... | 14 | 16 | 5 | 42 | 19 | 20 | 7 | 44 | 26 Mar. (85).. | 1 Sun.... | 200 | .600 | 66 | 993 | 273 | | | 4711 |
| 28 Mar. (87).. | 4 Wed.... | 29 | 47 | 11 | 55 | 34 | 52 | 13 | 57 | 16 Mar. (75).. | 6 Fri..... | 323 | .969 | 281 | 677 | 245 | | | 4712 |
| 28 Mar. (87).. | 5 Thur.... | 45 | 19 | 18 | 7 | 50 | 23 | 20 | 9 | 5 Mar. (64).. | 3 Tues.... | 160 | .480 | 156 | 724 | 214 | | | 4713 |
| 28 Mar. (87).. | 0 Sat..... | 0 | 50 | 0 | 20 | 5 | 55 | 2 | 22 | 23 Mar. (83).. | 2 Mon.... | 213 | .639 | 191 | 660 | 265 | | | 4714 |

† See footnote p. liii above. ⊙ See Text. Art. 101 above, para. 2.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR | | | | | | | | II. ADDED LUNAR MONTHS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| Kali. | Śaka | Chaitrâdi. Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | Luni-Solar cycle (Southern.) | Bṛihaspati cycle (Northern) current at Mesha saṅkrânti | Name of month | Time of the preceding saṅkrânti expressed in: Lunation parts (*l*.) | Tithis. | Time of the succeeding saṅkrânti expressed in: Lunation parts (*l*.) | Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4715 | 1536 | 1671 | 1020 | 788- 89 | 1613-14 | 47 Pramâdin | 56 Dundubhi | | | | | |
| 4716 | 1537 | 1672 | 1021 | 789- 90 | 1614-15 | 48 Ânanda | 57 Rudhirodgârin | 3 Jyeshṭha | 9943 | 29.829 | 495 | 1.485 |
| 4717 | 1538 | 1673 | 1022 | 790- 91 | 1615-16 | 49 Râkshasa | 58 Raktâksha | | | | | |
| 4718 | 1539 | 1674 | 1023 | 791- 92 | *1616-17 | 50 Anala | 59 Krodhana | 7 Âśvina | 9880 | 29.640 | 119 | 0.357 |
| 4719 | 1540 | 1675 | 1024 | 792- 93 | 1617-18 | 51 Piṅgala | 60 Kshaya | | | | | |
| 4720 | 1541 | 1676 | 1025 | 793- 94 | 1618-19 | 52 Kâlayukta | 1 Prabhava | | | | | |
| 4721 | 1542 | 1677 | 1026 | 794- 95 | 1619-20 | 53 Siddhârthin | 2 Vibhava | 5 Śrâvaṇa | 9825 | 29.475 | 600 | 1.800 |
| 4722 | 1543 | 1678 | 1027 | 795- 96 | *1620-21 | 54 Raudra | 3 Śukla | | | | | |
| 4723 | 1544 | 1679 | 1028 | 796- 97 | 1621-22 | 55 Durmati | 4 Pramoda | | | | | |
| 4724 | 1545 | 1680 | 1029 | 797- 98 | 1622-23 | 56 Dundubhi | 5 Prajâpati | 4 Âshâḍha | 9967 | 29.901 | 720 | 2.160 |
| 4725 | 1546 | 1681 | 1030 | 798- 99 | 1623-24 | 57 Rudhirodgârin | 6 Âṅgiras | | | | | |
| 4726 | 1547 | 1682 | 1031 | 799-800 | *1624-25 | 58 Raktâksha | 7 Śrîmukha | | | | | |
| 4727 | 1548 | 1683 | 1032 | 800- 1 | 1625-26 | 59 Krodhana | 8 Bhâva | 1 Chaitra | 9791 | 29.373 | 132 | 0.396 |
| 4728 | 1549 | 1684 | 1033 | 801- 2 | 1626-27 | 60 Kshaya | 9 Yuvan | | | | | |
| 4729 | 1550 | 1685 | 1034 | 802- 3 | 1627-28 | 1 Prabhava | 10 Dhâtri | 5 Śrâvaṇa | 9368 | 28.104 | 116 | 0.348 |
| 4730 | 1551 | 1686 | 1035 | 803- 4 | *1628-29 | 2 Vibhava | 11 Îśvara | | | | | |
| 4731 | 1552 | 1687 | 1036 | 804- 5 | 1629-30 | 3 Śukla | 12 Bahudhânya | | | | | |
| 4732 | 1553 | 1688 | 1037 | 805- 6 | 1630-31 | 4 Pramoda | 13 Pramâthin | 4 Âshâḍha | 9469 | 28.407 | 249 | 0.747 |
| 4733 | 1554 | 1689 | 1038 | 806- 7 | 1631-32 | 5 Prajâpati | 14 Vikrama | | | | | |
| 4734 | 1555 | 1690 | 1039 | 807- 8 | *1632-33 | 6 Âṅgiras | 15 Vrisha | | | | | |
| 4735 | 1556 | 1691 | 1040 | 808- 9 | 1633-34 | 7 Śrîmukha | 16 Chitrabhânu | 2 Vaiśâkha | 9651 | 28.953 | 123 | 0.369 |
| 4736 | 1557 | 1692 | 1041 | 809- 10 | 1634-35 | 8 Bhâva | 17 Subhânu | | | | | |
| 4737 | 1558 | 1693 | 1042 | 810- 11 | 1635-36 | 9 Yuvan | 18 Târaṇa | 6 Bhâdrapada | 9620 | 28.860 | 77 | 0.231 |
| 4738 | 1559 | 1694 | 1043 | 811- 12 | *1636-37 | 10 Dhâtri | 19 Pârthiva | | | | | |
| 4739 | 1560 | 1695 | 1044 | 812- 13 | 1637-38 | 11 Îśvara | 20 Vyaya | | | | | |
| 4740 | 1561 | 1696 | 1045 | 813- 14 | 1638-39 | 12 Bahudhânya | 21 Sarvajit | 5 Śrâvaṇa | 9805 | 29.415 | 593 | 1.779 |
| 4741 | 1562 | 1697 | 1046 | 814- 15 | 1639-40 | 13 Pramâthin | 22 Sarvadhârin | | | | | |
| 4742 | 1563 | 1698 | 1047 | 815- 16 | *1640-41 | 14 Vikrama | 23 Virodhin | | | | | |
| 4743 | 1564 | 1699 | 1048 | 816- 17 | 1641-42 | 15 Vrisha | 24 Vikrita | 3 Jyeshṭha | 9602 | 28.806 | 152 | 0.456 |
| 4744 | 1565 | 1700 | 1049 | 817- 18 | 1642-43 | 16 Chitrabhânu | 25 Khara | | | | | |
| 4745 | 1566 | 1701 | 1050 | 818- 19 | 1643-44 | 17 Subhânu | 26 Nandana | | | | | |
| 4746 | 1567 | 1702 | 1051 | 819- 20 | *1644-45 | 18 Târaṇa | 27 Vijaya | 1 Chaitra | 9749 | 29.247 | 114 | 0.342 |
| 4747 | 1568 | 1703 | 1052 | 820- 21 | 1645-46 | 19 Pârthiva | 28 Jaya | | | | | |

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

III. COMMENCEMENT OF THE

| Solar year. Day and Month A. D. | Solar year. (Time of the Mesha saṅkrânti.) Week day. | By the Ârya Siddhânta. Gh. | Pa. | H. | M. | By the Sûrya Siddhânta. Gh. | Pa. | H. | M. | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) Day and Month A. D. | Week day | At Sunrise on meridian of Ujjain. Moon's Age. Lunat. parts elapsed. (t.) | Tithis elapsed. | a. | b. | c. | Kali. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | 14 | 15 | | 17 | | 15a | | 17a | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 28 Mar. (87).. | 1 Sun.... | 16 | 21 | 6 | 32 | 21 | 26 | 8 | 35 | 12 Mar. (71).. | 6 Fri.... | 201 | .603 | 67 | 507 | 233 | 4715 |
| 28 Mar. (87).. | 2 Mon. | 31 | 52 | 12 | 45 | 36 | 58 | 14 | 47 | 1 Mar. (60).. | 3 Tues.... | 196 | .588 | 9942 | 354 | 204 | 4716 |
| 28 Mar. (87).. | 3 Tues... | 47 | 24 | 18 | 57 | 52 | 30 | 21 | 0 | 20 Mar. (79).. | 2 Mon.... | 253 | .759 | 9977 | 290 | 255 | 4717 |
| 28 Mar. (88). | 5 Thur... | 2 | 55 | 1 | 10 | 8 | 1 | 3 | 12 | 8 Mar. (68).. | 6 Fri..... | 101 | .303 | 9853 | 138 | 224 | 4718 |
| 28 Mar. (87).. | 6 Fri.... | 18 | 26 | 7 | 22 | 23 | 33 | 9 | 25 | 27 Mar. (86).. | 5 Thur... | 92 | .276 | 9888 | 74 | 276 | 4719 |
| 28 Mar. (87).. | 0 Sat..... | 33 | 57 | 13 | 35 | 39 | 4 | 15 | 38 | 17 Mar. (76).. | 3 Tues.... | 204 | .612 | 102 | 957 | 248 | 4720 |
| 28 Mar. (87). | 1 Sun. | 49 | 29 | 19 | 47 | 54 | 36 | 21 | 50 | 6 Mar. (65).. | 0 Sat..... | ⊙−14 | −.042 | 9977 | 804 | 217 | 4721 |
| 28 Mar. (88).. | 3 Tues.... | 5 | 0 | 2 | 0 | 10 | 7 | 4 | 3 | 24 Mar. (84).. | 6 Fri..... | 12 | .036 | 12 | 740 | 268 | 4722 |
| 28 Mar. (87).. | 4 Wed.. | 20 | 31 | 8 | 12 | 25 | 39 | 10 | 15 | 14 Mar. (73).. | 4 Wed.... | 268 | .804 | 226 | 624 | 240 | 4723 |
| 28 Mar. (87).. | 5 Thur | 36 | 2 | 14 | 25 | 41 | 10 | 16 | 28 | 3 Mar. (62).. | 1 Sun.... | 269 | .807 | 102 | 471 | 209 | 4724 |
| 28 Mar. (87).. | 6 Fri.. | 51 | 34 | 20 | 37 | 56 | 42 | 22 | 41 | 21 Mar. (80).. | 6 Fri..... | 39 | .117 | 9798 | 371 | 258 | 4725 |
| 28 Mar. (88).. | 1 Sun... | 7 | 5 | 2 | 50 | 12 | 13 | 4 | 53 | 10 Mar. (70).. | 4 Wed.... | 292 | .876 | 12 | 254 | 230 | 4726 |
| 28 Mar. (87).. | 2 Mon.... | 22 | 36 | 9 | 2 | 27 | 45 | 11 | 6 | 27 Feb. (58).. | 1 Sun.... | 115 | .345 | 9883 | 101 | 199 | 4727 |
| 28 Mar. (87).. | 3 Tues. | 38 | 7 | 15 | 15 | 43 | 16 | 17 | 19 | 18 Mar. (77).. | 0 Sat..... | 95 | .285 | 9923 | 37 | 250 | 4728 |
| 28 Mar. (87).. | 4 Wed... | 53 | 39 | 21 | 27 | 58 | 48 | 23 | 31 | 8 Mar. (67).. | 5 Thur... | 211 | .632 | 137 | 921 | 222 | 4729 |
| 28 Mar. (88).. | 6 Fri. | 9 | 10 | 3 | 40 | 14 | 19 | 5 | 44 | 26 Mar. (86).. | 4 Wed.... | 203 | .609 | 172 | 857 | 273 | 4730 |
| 28 Mar. (87).. | 0 Sat.... | 24 | 41 | 9 | 52 | 29 | 51 | 11 | 56 | 15 Mar. (74).. | 1 Sun.... | 54 | .162 | 48 | 704 | 242 | 4731 |
| 28 Mar. (87).. | 1 Sun. | 40 | 12 | 16 | 5 | 45 | 22 | 18 | 9 | 5 Mar. (64).. | 6 Fri.... | 330 | .990 | 262 | 558 | 214 | 4732 |
| 28 Mar. (87).. | 2 Mon.... | 55 | 44 | 22 | 17 | †0 | 54 | †0 | 22 | 23 Mar. (82).. | 4 Wed.... | 110 | .330 | 9958 | 487 | 263 | 4733 |
| 28 Mar. (88).. | 4 Wed.. | 11 | 15 | 4 | 30 | 16 | 25 | 6 | 34 | 11 Mar. (71).. | 1 Sun.... | 94 | .282 | 9834 | 335 | 232 | 4734 |
| 28 Mar. (87).. | 5 Thur.. | 26 | 46 | 10 | 42 | 31 | 57 | 12 | 47 | 1 Mar. (60).. | 6 Fri. | 328 | .984 | 45 | 218 | 204 | 4735 |
| 28 Mar. (87).. | 6 Fri... | 42 | 17 | 16 | 55 | 47 | 28 | 18 | 59 | 19 Mar. (78).. | 4 Wed.... | ⊙−11 | −.033 | 9744 | 118 | 253 | 4736 |
| 28 Mar. (87).. | 0 Sat. | 57 | 49 | 23 | 7 | †3 | 0 | †1 | 12 | 9 Mar. (68).. | 2 Mon.... | 100 | .300 | 9955 | 1 | 225 | 4737 |
| 28 Mar. (88).. | 2 Mon.. | 13 | 20 | 5 | 20 | 18 | 32 | 7 | 25 | 27 Mar. (87).. | 1 Sun.... | 80 | .240 | 9993 | 937 | 276 | 4738 |
| 28 Mar. (87).. | 3 Tues.. | 28 | 51 | 11 | 32 | 34 | 3 | 13 | 37 | 17 Mar. (76).. | 6 Fri..... | 220 | .660 | 207 | 821 | 248 | 4739 |
| 28 Mar. (87).. | 4 Wed. | 44 | 22 | 17 | 45 | 49 | 35 | 19 | 50 | 6 Mar. (65).. | 3 Tues.... | 102 | .306 | 83 | 668 | 217 | 4740 |
| 28 Mar. (87).. | 5 Thur... | 59 | 54 | 23 | 57 | †5 | 6 | †2 | 2 | 25 Mar. (84).. | 2 Mon.... | 172 | .516 | 118 | 604 | 268 | 4741 |
| 28 Mar. (88).. | 0 Sat... | 15 | 25 | 6 | 10 | 20 | 38 | 8 | 15 | 13 Mar. (73).. | 6 Fri..... | 176 | .528 | 9993 | 451 | 237 | 4742 |
| 28 Mar. (87).. | 1 Sun. | 30 | 56 | 12 | 22 | 36 | 9 | 14 | 28 | 3 Mar. (61).. | 3 Tues.... | 145 | .435 | 9869 | 298 | 207 | 4743 |
| 28 Mar. (87).. | 2 Mon. | 46 | 27 | 18 | 35 | 51 | 41 | 20 | 40 | 21 Mar. (80).. | 2 Mon.... | 183 | .549 | 9904 | 234 | 255 | 4744 |
| 29 Mar. (88).. | 4 Wed. | 1 | 59 | 0 | 47 | 7 | 12 | 2 | 53 | 10 Mar. (69).. | 6 Fri..... | ⊙−12 | −.036 | 9779 | 82 | 227 | 4745 |
| 28 Mar. (88).. | 5 Thur | 17 | 30 | 7 | 0 | 22 | 44 | 9 | 5 | 28 Feb. (59).. | 4 Wed.... | 107 | .321 | 9994 | 965 | 199 | 4746 |
| 28 Mar. (87).. | 6 Fri..... | 33 | 1 | 13 | 12 | 38 | 15 | 13 | 16 | 18 Mar. (77).. | 3 Tues.... | 86 | .258 | 28 | 901 | 250 | 4747 |

† See footnote p. liii above. ⊙ See Text Art. 101 above, para. 2.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR | | | | | | | | II. ADDED LUNAR MONTHS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| | | | | | | | | | Time of the preceding saṅkrânti expressed in | | Time of the succeeding saṅkrânti expressed in | |
| Kali. | Śaka. | Chaitrâdi. Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | Luni-Solar cycle (Southern.) | Bṛihaspati cycle (Northern) current at Mesha saṅkrânti | Name of month. | Lunation parts (l.) | Tithis. | Lunation parts (l.) | Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4748 | 1569 | 1704 | 1055 | 821-22 | 1646-47 | 20 Vyaya | 29 Manmatha | 5 Śrâvaṇa | 9328 | 27.984 | 133 | 0.399 |
| 4749 | 1570 | 1705 | 1056 | 822-23 | 1647-48 | 21 Sarvajit | 30 Durmukha | | | | | |
| 4750 | 1571 | 1706 | 1057 | 823-24 | *1648-49 | 22 Sarvadhârin | 31 Hemalamba | | | | | |
| 4751 | 1572 | 1707 | 1058 | 824-25 | 1649-50 | 23 Virodhin | 32 Vilamba | 4 Âshâḍha | 9618 | 28.854 | 294 | 0.882 |
| 4752 | 1573 | 1708 | 1059 | 825-26 | 1650-51 | 24 Vikṛita | 33 Vikârin | | | | | |
| 4753 | 1574 | 1709 | 1060 | 826-27 | 1651-52 | 25 Khara | 34 Śârvari | | | | | |
| 4754 | 1575 | 1710 | 1061 | 827-28 | *1652-53 | 26 Nandana | 35 Plava | 2 Vaiśâkha | 9658 | 28.974 | 216 | 0.648 |
| 4755 | 1576 | 1711 | 1062 | 828-29 | 1653-54 | 27 Vijaya | 36 Śubhakṛit | | | | | |
| 4756 | 1577 | 1712 | 1063 | 829-30 | 1654-55 | 28 Jaya | 37 Śobhana | 6 Bhâdrapada | 9670 | 29.010 | 219 | 0.657 |
| 4757 | 1578 | 1713 | 1064 | 830-31 | 1655-56 | 29 Manmatha | 38 Krodhin | | | | | |
| 4758 | 1579 | 1714 | 1065 | 831-32 | *1656-57 | 30 Durmukha | 39 Viśvâvasu | | | | | |
| 4759 | 1580 | 1715 | 1066 | 832-33 | 1657-58 | 31 Hemalamba | 40 Parâbhava | 5 Śrâvaṇa | 9800 | 29.400 | 552 | 1.656 |
| 4760 | 1581 | 1716 | 1067 | 833-34 | 1658-59 | 32 Vilamba | 41 Plavaṅga | | | | | |
| 4761 | 1582 | 1717 | 1068 | 834-35 | 1659-60 | 33 Vikârin | 42 Kîlaka | | | | | |
| 4762 | 1583 | 1718 | 1069 | 835-36 | *1660-61 | 34 Śârvari | 43 Saumya | 3 Jyeshṭha | 9727 | 29.181 | 343 | 1.029 |
| 4763 | 1584 | 1719 | 1070 | 836-37 | 1661-62 | 35 Plava | 44 Sâdhâraṇa | | | | | |
| 4764 | 1585 | 1720 | 1071 | 837-38 | 1662-63 | 36 Śubhakṛit | 45 Virodhakṛit | | | | | |
| 4765 | 1586 | 1721 | 1072 | 838-39 | 1663-64 | 37 Śobhana | 46 Paridhâvin | 1 Chaitra | 9749 | 29.247 | 72 | 0.216 |
| 4766 | 1587 | 1722 | 1073 | 839-40 | *1664-65 | 38 Krodhin | 47 Pramâdin | | | | | |
| 4767 | 1588 | 1723 | 1074 | 840-41 | 1665-66 | 39 Viśvâvasu | 48 Ânanda | 5 Śrâvaṇa | 9319 | 27.957 | 94 | 0.282 |
| 4768 | 1589 | 1724 | 1075 | 841-42 | 1666-67 | 40 Parâbhava | 49 Râkshasa | | | | | |
| 4769 | 1590 | 1725 | 1076 | 842-43 | 1667-68 | 41 Plavaṅga | 50 Anala | | | | | |
| 4770 | 1591 | 1726 | 1077 | 843-44 | *1668-69 | 42 Kîlaka | 51 Piṅgala | 4 Âshâḍha | 9814 | 29.442 | 438 | 1.314 |
| 4771 | 1592 | 1727 | 1078 | 844-45 | 1669-70 | 43 Saumya | 52 Kâlayukta | | | | | |
| 4772 | 1593 | 1728 | 1079 | 845-46 | 1670-71 | 44 Sâdhâraṇa | 53 Siddhârthin | | | | | |
| 4773 | 1594 | 1729 | 1080 | 846-47 | 1671-72 | 45 Virodhakṛit | 54 Raudra | 2 Vaiśâkha | 9616 | 28.848 | 212 | 0.636 |
| 4774 | 1595 | 1730 | 1081 | 847-48 | *1672-73 | 46 Paridhâvin | 55 Durmati | | | | | |
| 4775 | 1596 | 1731 | 1082 | 848-49 | 1673-74 | 47 Pramâdin | 56 Dundubhi | 6 Bhâdrapada | 9641 | 28.923 | 262 | 0.786 |
| 4776 | 1597 | 1732 | 1083 | 849-50 | 1674-75 | 48 Ânanda | 57 Rudhirodgârin | | | | | |
| 4777 | 1598 | 1733 | 1084 | 850-51 | 1675-76 | 49 Râkshasa | 58 Raktâksha | | | | | |
| 4778 | 1599 | 1734 | 1085 | 851-52 | *1676-77 | 50 Anala | 59 Krodhana | 5 Śrâvaṇa | 9913 | 29.739 | 363 | 1.089 |
| 4779 | 1600 | 1735 | 1086 | 852-53 | 1677-78 | 51 Piṅgala | 60 Kshaya | | | | | |
| 4780 | 1601 | 1736 | 1087 | 853-54 | 1678-79 | 52 Kâlayukta | 1 Prabhava | | | | | |

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

| III. COMMENCEMENT OF THE | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Solar year. | | | | | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | |
| * Day and Month. A. D. | (Time of the Mesha saṅkrânti.) | | | | | | | | | Day and Month. A. D. | Week day. | At Sunrise on meridian of Ujjain. | | | | Kali. |
| | Week day | By the Ârya Siddhânta | | | | By the Sûrya Siddhânta | | | | | | Moon's Age. | | | | |
| | | Gh. | Pa. | H. | M. | Gh. | Pa. | H. | M. | | | Lunar parts elapsed (t.) | Tithis elapsed | a. | b. | c. | |
| 13 | 14 | 15 | | 17 | | 15a | | 17a | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 28 Mar. (87).. | 0 Sat.... | 48 | 32 | 19 | 25 | 53 | 47 | 21 | 31 | 8 Mar. (67).. | 1 Sun | 247 | .741 | 243 | 784 | 222 | 4748 |
| 29 Mar. (88).. | 2 Mon.... | 4 | 4 | 1 | 37 | 9 | 18 | 3 | 43 | 27 Mar. (86).. | 0 Sat. . | 280 | .840 | 277 | 721 | 273 | 4749 |
| 28 Mar. (88).. | 3 Tues.... | 19 | 35 | 7 | 50 | 24 | 50 | 9 | 56 | 15 Mar. (75).. | 4 Wed.... | 235 | .705 | 158 | 568 | 243 | 4750 |
| 28 Mar. (87).. | 4 Wed.... | 35 | 6 | 14 | 2 | 40 | 21 | 16 | 9 | 4 Mar. (63).. | 1 Sun .. | 242 | .726 | 29 | 415 | 212 | 4751 |
| 28 Mar. (87).. | 5 Thur.... | 50 | 37 | 20 | 15 | 55 | 53 | 22 | 21 | 23 Mar. (82).. | 0 Sat. .. | 315 | .945 | 63 | 351 | 263 | 4752 |
| 29 Mar. (88).. | 0 Sat.... | 6 | 9 | 2 | 27 | 11 | 24 | 4 | 34 | 12 Mar. (71).. | 4 Wed... | 211 | .633 | 9939 | 194 | 232 | 4753 |
| 28 Mar. (88).. | 1 Sun.... | 21 | 40 | 8 | 40 | 26 | 56 | 10 | 46 | 29 Feb. (60).. | 1 Sun | ⊙ —2 | —.006 | 9815 | 45 | 202 | 4754 |
| 28 Mar. (87).. | 2 Mon. .. | 37 | 11 | 14 | 52 | 42 | 27 | 16 | 59 | 19 Mar. (78).. | 0 Sat.... | ⊙—27 | —.081 | 9850 | 981 | 253 | 4755 |
| 28 Mar. (87).. | 3 Tues.... | 52 | 42 | 21 | 5 | 57 | 59 | 23 | 12 | 9 Mar. (68).. | 5 Thur.... | 100 | .300 | 64 | 865 | 225 | 4756 |
| 29 Mar. (88).. | 5 Thur.... | 8 | 14 | 3 | 17 | 13 | 30 | 5 | 24 | 28 Mar. (87).. | 4 Wed. .. | 107 | .321 | 99 | 801 | 276 | 4757 |
| 28 Mar. (88).. | 6 Fri.... | 23 | 45 | 9 | 30 | 29 | 2 | 11 | 37 | 16 Mar. (76).. | 1 Sun.... | 2 | .006 | 9974 | 648 | 245 | 4758 |
| 28 Mar. (87).. | 0 Sat.... | 39 | 16 | 15 | 42 | 44 | 34 | 17 | 49 | 6 Mar. (65).. | 6 Fri.... | 302 | .906 | 189 | 532 | 217 | 4759 |
| 28 Mar. (87).. | 1 Sun.... | 54 | 47 | 21 | 55 | †0 | 5 | †0 | 2 | 24 Mar. (83).. | 4 Wed... | 84 | .252 | 9885 | 431 | 260 | 4760 |
| 29 Mar. (88).. | 3 Tues.... | 10 | 19 | 4 | 7 | 15 | 37 | 6 | 15 | 13 Mar. (72).. | 1 Sun.... | 37 | .112 | 9760 | 278 | 235 | 4761 |
| 28 Mar. (88).. | 4 Wed. .. | 25 | 50 | 10 | 20 | 31 | 8 | 12 | 27 | 2 Mar. (62).. | 6 Fri.... | 236 | .708 | 9975 | 162 | 207 | 4762 |
| 28 Mar. (87).. | 5 Thur.... | 41 | 21 | 16 | 32 | 46 | 40 | 18 | 40 | 21 Mar. (80).. | 5 Thur.... | 230 | .690 | 9 | 98 | 258 | 4763 |
| 28 Mar. (87).. | 6 Fri.... | 56 | 52 | 22 | 45 | †2 | 11 | †0 | 52 | 10 Mar. (69).. | 2 Mon.. . | ⊙—29 | —.087 | 9885 | 945 | 227 | 4764 |
| 29 Mar. (88).. | 1 Sat.... | 12 | 24 | 4 | 57 | 17 | 43 | 7 | 5 | 28 Feb. (59).. | 0 Sat.... | 119 | .357 | 99 | 829 | 199 | 4765 |
| 28 Mar. (88).. | 2 Mon.... | 27 | 55 | 11 | 10 | 33 | 14 | 13 | 18 | 18 Mar. (78).. | 6 Fri.... | 134 | .402 | 134 | 765 | 251 | 4766 |
| 28 Mar. (87).. | 3 Tues. .. | 43 | 26 | 17 | 22 | 48 | 46 | 19 | 30 | 7 Mar. (66).. | 3 Tues .. | 60 | .180 | 10 | 612 | 220 | 4767 |
| 28 Mar. (87).. | 4 Wed. .. | 58 | 57 | 23† | 35 | †4 | 17 | †1 | 43 | 26 Mar. (85).. | 2 Mon.... | 142 | .426 | 44 | 548 | 271 | 4768 |
| 29 Mar. (88).. | 6 Fri.... | 14 | 29 | 5 | 47 | 19 | 49 | 7 | 56 | 15 Mar. (74).. | 6 Fri. ... | 147 | .441 | 9920 | 395 | 240 | 4769 |
| 28 Mar. (88).. | 0 Sat.... | 30 | 0 | 12 | 0 | 35 | 20 | 14 | 8 | 3 Mar. (63).. | 3 Tues. .. | 78 | .234 | 9796 | 243 | 209 | 4770 |
| 28 Mar. (87).. | 1 Sun.... | 45 | 31 | 18 | 12 | 50 | 52 | 20 | 21 | 22 Mar. (81).. | 2 Mon.... | 97 | .293 | 9831 | 178 | 261 | 4771 |
| 29 Mar. (88).. | 3 Tues ... | 1 | 2 | 0 | 25 | 6 | 23 | 2 | 33 | 12 Mar. (71).. | 0 Sat.... | 238 | .714 | 44 | 62 | 233 | 4772 |
| 29 Mar. (88).. | 4 Wed.... | 16 | 34 | 6 | 37 | 21 | 55 | 8 | 46 | 1 Mar. (60).. | 4 Wed... | ⊙—12 | —.036 | 9921 | 909 | 202 | 4773 |
| 28 Mar. (88).. | 5 Thur.... | 32 | 5 | 12 | 50 | 37 | 26 | 14 | 59 | 19 Mar. (80).. | 3 Tues ... | ⊙—30 | —.090 | 9955 | 845 | 253 | 4774 |
| 28 Mar. (87).. | 6 Fri.... | 47 | 36 | 19 | 2 | 52 | 58 | 21 | 11 | 9 Mar. (68).. | 1 Sun.... | 172 | .516 | 170 | 728 | 225 | 4775 |
| 29 Mar. (88).. | 1 Sun.... | 3 | 7 | 1 | 15 | 8 | 29 | 3 | 24 | 28 Mar. (87).. | 0 Sat.... | 225 | .675 | 204 | 664 | 276 | 4776 |
| 29 Mar. (88).. | 2 Mon.... | 18 | 39 | 7 | 27 | 24 | 1 | 9 | 36 | 17 Mar. (76).. | 4 Wed ... | 209 | .627 | 80 | 512 | 245 | 4777 |
| 28 Mar. (88).. | 3 Tues ... | 34 | 10 | 13 | 40 | 39 | 32 | 15 | 49 | 5 Mar. (65).. | 1 Sun.... | 205 | .615 | 9956 | 359 | 214 | 4778 |
| 28 Mar. (87).. | 4 Wed ... | 49 | 41 | 19 | 52 | 55 | 4 | 22 | 2 | 24 Mar. (83).. | 0 Sat.... | 265 | .795 | 9990 | 295 | 266 | 4779 |
| 29 Mar. (88).. | 6 Fri.... | 5 | 12 | 2 | 5 | 10 | 36 | 4 | 14 | 13 Mar. (72).. | 4 Wed... | 115 | .345 | 9866 | 142 | 235 | 4780 |

† See footnote p. liii above. ⊙ See Text, Art. 101 above, para. 2.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR | | | | | | | | II. ADDED LUNAR MONTHS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| Kali. | Saka. | Chaitrâdi Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | Luni-Solar cycle. (Southern.) | Brihaspati cycle (Northern) current at Mesha saṅkrânti. | Name of month. | Time of the preceding saṅkrânti expressed in: Lunation parts (t.) | Time of the preceding saṅkrânti expressed in: Tithis. | Time of the succeeding saṅkrânti expressed in: Lunation parts (t.) | Time of the succeeding saṅkrânti expressed in: Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4781 | 1602 | 1737 | 1086 | 854-55 | 1679-80 | 53 Siddhârthin... | 2 Vibhava...... | 3 Jyeshṭha... | 9755 | 29.265 | 470 | 1.410 |
| 4782 | 1603 | 1738 | 1087 | 855-56 | *1680-81 | 54 Raudra...... | 3 Śukla. | | | | | |
| 4783 | 1604 | 1739 | 1088 | 856-57 | 1681-82 | 55 Durmati..... | 4 Pramoda | 7 Âśvina..... | 9788 | 29.364 | 110 | 0.330 |
| | | | | | | | | 10 *Pausha(Ksh.)* | 94 | 0.282 | 9930 | 29.790 |
| 4784 | 1605 | 1740 | 1089 | 857-58 | 1682-83 | 56 Dundubhi.... | 5 Prajâpati. | 1 Chaitra.. | 9920 | 29.760 | 99 | 0.297 |
| 4785 | 1606 | 1741 | 1090 | 858-59 | 1683-84 | 57 Rudhirodgârin | 6 Aṅgiras. | | | | | |
| 4786 | 1607 | 1742 | 1091 | 859-60 | *1684-85 | 58 Raktâksha... | 7 Śrîmukha | 5 Śrâvaṇa. | 9394 | 28.182 | 82 | 0.246 |
| 4787 | 1608 | 1743 | 1092 | 860-61 | 1685-86 | 59 Krodhana... | 8 Bhâva [1] | | | | | |
| 4788 | 1609 | 1744 | 1093 | 861-62 | 1686-87 | 60 Kshaya..... | 10 Dhâtri.. | | | | | |
| 4789 | 1610 | 1745 | 1094 | 862-63 | 1687-88 | 1 Prabhava | 11 Îśvara | 4 Âshâḍha. | 9671 | 29.013 | 634 | 1.902 |
| 4790 | 1611 | 1746 | 1095 | 863-64 | *1688-89 | 2 Vibhava...... | 12 Bahudhânya.. | | | | | |
| 4791 | 1612 | 1747 | 1096 | 864-65 | 1689-90 | 3 Śukla....... | 13 Pramâthin.. | | | | | |
| 4792 | 1613 | 1748 | 1097 | 865-66 | 1690-91 | 4 Pramoda .... | 14 Vikrama... | 2 Vaiśâkha | 9613 | 28.839 | 169 | 0.507 |
| 4793 | 1614 | 1749 | 1098 | 866-67 | 1691-92 | 5 Prajâpati..... | 15 Vrisha...... | | | | | |
| 4794 | 1615 | 1750 | 1099 | 867-68 | *1692-93 | 6 Âṅgiras...... | 16 Chitrabhânu. | 6 Bhâdrapada.. | 9609 | 28.827 | 216 | 0.648 |
| 4795 | 1616 | 1751 | 1100 | 868-69 | 1693-94 | 7 Śrîmukha.... | 17 Subhânu | | | | | |
| 4796 | 1617 | 1752 | 1101 | 869-70 | 1694-95 | 8 Bhâva....... | 18 Târaṇa..... | | | | | |
| 4797 | 1618 | 1753 | 1102 | 870-71 | 1695-96 | 9 Yuvan...... | 19 Pârthiva | 4 Âshâḍha.. | 9459 | 28.377 | 99 | 0.297 |
| 4798 | 1619 | 1754 | 1103 | 871-72 | *1696-97 | 10 Dhâtri..... | 20 Vyaya | | | | | |
| 4799 | 1620 | 1755 | 1104 | 872-73 | 1697-98 | 11 Îśvara..... | 21 Sarvajit. | | | | | |
| 4800 | 1621 | 1756 | 1105 | 873-74 | 1698-99 | 12 Bahudhânya.. | 22 Sarvadhârin | 3 Jyeshṭha. | 9714 | 29.142 | 511 | 1.533 |
| 4801 | 1622 | 1757 | 1106 | 874-75 | 1699-700 | 13 Pramâthin .. | 23 Virodhin. | | | | | |
| 4802 | 1623 | 1758 | 1107 | 875-76 | *1700-1 | 14 Vikrama.... | 24 Vikṛita | 7 Âśvina.... | 9772 | 29.316 | 147 | 0.441 |
| 4803 | 1624 | 1759 | 1108 | 876-77 | 1701-2 | 15 Vrisha..... | 25 Khara | | | | | |
| 4804 | 1625 | 1760 | 1109 | 877-78 | 1702-3 | 16 Chitrabhânu. | 26 Nandana | | | | | |
| 4805 | 1626 | 1761 | 1110 | 878-79 | 1703-4 | 17 Subhânu..... | 27 Vijaya....... | 5 Śrâvaṇa..... | 9574 | 28.722 | 168 | 0.504 |
| 4806 | 1627 | 1762 | 1111 | 879-80 | *1704-5 | 18 Târaṇa...... | 28 Jaya | | | | | |
| 4807 | 1628 | 1763 | 1112 | 880-81 | 1705-6 | 19 Pârthiva..... | 29 Manmatha | | | | | |
| 4808 | 1629 | 1764 | 1113 | 881-82 | 1706-7 | 20 Vyaya....... | 30 Durmukha.... | 3 Jyeshṭha.... | 9270 | 27.810 | 30 | 0.090 |
| 4809 | 1630 | 1765 | 1114 | 882-83 | 1707-8 | 21 Sarvajit...... | 31 Hemalamba.. | | | | | |
| 4810 | 1631 | 1766 | 1115 | 883-84 | *1708-9 | 22 Sarvadhârin. | 32 Vilamba. | | | | | |
| 4811 | 1632 | 1767 | 1116 | 884-85 | 1709-10 | 23 Virodhin .... | 33 Vikârin | 2 Vaiśâkha | 9706 | 29.118 | 187 | 0.561 |

[1] Yuvan, No. 9, was suppressed in the north.

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

| III. COMMENCEMENT OF THE | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Solar year. | | | | | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | Kali |
| Day and Month. A. D. | (Time of the Mesha saṅkrānti.) | | | | | | | | | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. | | | | | |
| | Week day | By the Ârya Siddhânta. | | | | By the Sûrya Siddhânta. | | | | | | Moon's Age. | | | | | |
| | | Gh. | Pa. | H. | M. | Gh. | Pa. | H. | M. | | | Lunar parts elapsed. (t.) | Tithis elapsed. | a. | b. | c. | |
| 13 | 14 | 15 | | 17 | | 15a | | 17a | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 29 Mar. (88). | 0 Sat.... | 20 | 44 | 8 | 17 | 26 | 7 | 10 | 27 | 4 Mar. (63).. | 2 Mon.... | 245 | .735 | 80 | 26 | 207 | 4781 |
| 28 Mar. (88).. | 1 Sun.... | 36 | 15 | 14 | 30 | 41 | 39 | 16 | 39 | 21 Mar. (81).. | 1 Sun.... | 222 | .666 | 115 | 962 | 258 | 4782 |
| †28 Mar. (87).. | 2 Mon.... | 51 | 46 | 20 | 42 | 57 | 10 | 22 | 52 | 10 Mar. (69).. | 5 Thur... | 1 | .003 | 9991 | 809 | 228 | 4783 |
| 29 Mar. (88).. | 4 Wed.... | 7 | 17 | 2 | 55 | 12 | 42 | 5 | 5 | 28 Feb. (59).. | 3 Tues... | 217 | .651 | 205 | 694 | 199 | 4784 |
| 29 Mar. (88).. | 5 Thur... | 22 | 49 | 9 | 7 | 28 | 13 | 11 | 17 | 19 Mar. (78).. | 2 Mon.... | 279 | .837 | 240 | 625 | 251 | 4785 |
| 28 Mar. (88).. | 6 Fri..... | 38 | 20 | 15 | 20 | 43 | 45 | 17 | 30 | 7 Mar. (67).. | 6 Fri..... | 278 | .834 | 115 | 475 | 220 | 4786 |
| 28 Mar. (87).. | 0 Sat..... | 53 | 51 | 21 | 32 | 59 | 16 | 23 | 42 | 25 Mar. (84).. | 4 Wed.... | 50 | .150 | 9811 | 375 | 269 | 4787 |
| 29 Mar. (88).. | 2 Mon.... | 9 | 22 | 3 | 45 | 14 | 48 | 5 | 55 | 15 Mar. (74).. | 2 Mon.... | 306 | .918 | 26 | 259 | 240 | 4788 |
| 29 Mar. (88).. | 3 Tues... | 24 | 54 | 9 | 57 | 30 | 19 | 12 | 8 | 4 Mar. (63).. | 6 Fri..... | 130 | .390 | 9961 | 106 | 210 | 4789 |
| 28 Mar. (88).. | 4 Wed.... | 40 | 25 | 16 | 10 | 45 | 51 | 18 | 20 | 22 Mar. (82).. | 5 Thur... | 113 | .339 | 9936 | 42 | 261 | 4790 |
| 28 Mar. (87).. | 5 Thur... | 55 | 56 | 22 | 22 | 61 | 23 | 24 | 33 | 12 Mar. (71).. | 3 Tues... | 226 | .678 | 150 | 925 | 233 | 4791 |
| 29 Mar. (88).. | 0 Sat..... | 11 | 27 | 4 | 35 | 16 | 54 | 6 | 46 | 1 Mar. (60).. | 0 Sat..... | 31 | .093 | 26 | 773 | 202 | 4792 |
| 29 Mar. (88).. | 1 Sun.... | 26 | 59 | 10 | 47 | 32 | 25 | 12 | 58 | 20 Mar. (79).. | 6 Fri..... | 66 | .198 | 61 | 708 | 253 | 4793 |
| 28 Mar. (88).. | 2 Mon.... | 42 | 30 | 17 | 0 | 47 | 57 | 19 | 11 | 8 Mar. (68).. | 3 Tues... | 28 | .084 | 9936 | 556 | 222 | 4794 |
| 28 Mar. (87).. | 3 Tues... | 58 | 1 | 23 | 12 | 63 | 28 | 25 | 23 | 27 Mar. (86).. | 2 Mon.... | 118 | .354 | 9971 | 492 | 274 | 4795 |
| 29 Mar. (88).. | 5 Thur... | 13 | 32 | 5 | 25 | 19 | 0 | 7 | 36 | 16 Mar. (75).. | 6 Fri..... | 105 | .315 | 9847 | 339 | 243 | 4796 |
| 29 Mar. (88).. | 6 Fri..... | 29 | 4 | 11 | 37 | 34 | 31 | 13 | 49 | 5 Mar. (64).. | 3 Tues... | ⊙ −4 | −.012 | 9723 | 186 | 212 | 4797 |
| 28 Mar. (88).. | 0 Sat..... | 44 | 35 | 17 | 50 | 50 | 3 | 20 | 1 | 23 Mar. (83).. | 2 Mon.... | ⊙ −6 | −.018 | 9757 | 122 | 263 | 4798 |
| 29 Mar. (88).. | 2 Mon.... | 0 | 6 | 0 | 2 | 5 | 34 | 2 | 14 | 13 Mar. (72).. | 0 Sat..... | 117 | .351 | 9972 | 6 | 285 | 4799 |
| 29 Mar. (88).. | 3 Tues... | 15 | 37 | 6 | 15 | 21 | 6 | 8 | 26 | 3 Mar. (62).. | 5 Thur... | 237 | .711 | 168 | 889 | 207 | 4800 |
| 29 Mar. (88).. | 4 Wed.... | 31 | 9 | 12 | 27 | 36 | 38 | 14 | 39 | 22 Mar. (81).. | 4 Wed.... | 236 | .708 | 221 | 825 | 259 | 4801 |
| 28 Mar. (88).. | 5 Thur... | 46 | 40 | 18 | 40 | 52 | 9 | 20 | 52 | 10 Mar. (70).. | 1 Sun.... | 112 | .336 | 96 | 672 | 228 | 4802 |
| 29 Mar. (88).. | 0 Sat..... | 2 | 11 | 0 | 52 | 7 | 41 | 3 | 4 | 29 Mar. (88).. | 0 Sat..... | 183 | .549 | 131 | 608 | 279 | 4803 |
| 29 Mar. (88).. | 1 Sun.... | 17 | 42 | 7 | 5 | 23 | 12 | 9 | 17 | 18 Mar. (77).. | 4 Wed.... | 186 | .558 | 7 | 455 | 248 | 4804 |
| 29 Mar. (88).. | 2 Mon.... | 33 | 14 | 13 | 17 | 38 | 44 | 15 | 29 | 7 Mar. (66).. | 1 Sun.... | 155 | .465 | 9882 | 303 | 217 | 4805 |
| 28 Mar. (88).. | 3 Tues... | 48 | 45 | 19 | 30 | 54 | 15 | 21 | 42 | 25 Mar. (85).. | 0 Sat..... | 197 | .591 | 9917 | 239 | 269 | 4806 |
| 29 Mar. (88).. | 5 Thur... | 4 | 16 | 1 | 42 | 9 | 47 | 3 | 55 | 14 Mar. (73).. | 4 Wed.... | 5 | .015 | 9793 | 86 | 238 | 4807 |
| 29 Mar. (88).. | 6 Fri..... | 19 | 47 | 7 | 55 | 25 | 18 | 10 | 7 | 4 Mar. (63).. | 2 Mon.... | 122 | .366 | 7 | 969 | 210 | 4808 |
| 29 Mar. (88).. | 0 Sat..... | 35 | 19 | 14 | 7 | 40 | 50 | 16 | 20 | 23 Mar. (82).. | 1 Sun.... | 103 | .309 | 42 | 906 | 261 | 4809 |
| 28 Mar. (88).. | 1 Sun.... | 50 | 50 | 20 | 20 | 56 | 21 | 22 | 32 | 12 Mar. (72).. | 6 Fri..... | 260 | .780 | 256 | 789 | 233 | 4810 |
| 29 Mar. (88).. | 3 Tues... | 6 | 21 | 2 | 32 | 11 | 53 | 4 | 45 | 1 Mar. (60).. | 3 Tues... | 169 | .507 | 132 | 636 | 202 | 4811 |

† See footnote p. liii above. ⊙ See Text. Art. 101 above, para. 2.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR | | | | | | | | II. ADDED LUNAR MONTHS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True | | | | |
| | | | | | | | | | Time of the preceding saṅkrânti expressed in | | Time of the succeeding saṅkrânti expressed in | |
| Kali. | Śaka. | Chaitrâdi Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | Luni-Solar cycle. (Southern.) | Bṛihaspati cycle (Northern) current at Mesha saṅkrânti. | Name of month. | Lunation parts. (*l.*) | Tithis. | Lunation parts. (*l.*) | Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4812 | 1633 | 1768 | 1117 | 885– 86 | 1710-11 | 24 Vikṛita | 34 Śârvari | | | | | |
| 4813 | 1634 | 1769 | 1118 | 886– 87 | 1711-12 | 25 Khara | 35 Plava | 6 Bhâdrapada | 9654 | 28.962 | 200 | 0.600 |
| 4814 | 1635 | 1770 | 1119 | 887– 88 | *1712-13 | 26 Nandana | 36 Śubhakṛit | | | | | |
| 4815 | 1636 | 1771 | 1120 | 888– 89 | 1713-14 | 27 Vijaya | 37 Śobhana | | | | | |
| 4816 | 1637 | 1772 | 1121 | 889– 90 | 1714-15 | 28 Jaya | 38 Krodhin | 4 Âshâḍha | 9900 | 29.700 | 283 | 0.849 |
| 4817 | 1638 | 1773 | 1122 | 890– 91 | 1715-16 | 29 Manmatha | 39 Viśvâvasu | | | | | |
| 4818 | 1639 | 1774 | 1123 | 891– 92 | *1716-17 | 30 Durmukha | 40 Parâbhava | | | | | |
| 4819 | 1640 | 1775 | 1124 | 892– 93 | 1717-18 | 31 Hemalamba | 41 Plavaṅga | 3 Jyeshṭha | 9695 | 29.085 | 457 | 1.371 |
| 4820 | 1641 | 1776 | 1125 | 893– 94 | 1718-19 | 32 Vilamba | 42 Kîlaka | | | | | |
| 4821 | 1642 | 1777 | 1126 | 894– 95 | 1719-20 | 33 Vikârin | 43 Saumya | 7 Âśvina | 9733 | 29.199 | 128 | 0.384 |
| 4822 | 1643 | 1778 | 1127 | 895– 96 | *1720-21 | 34 Śârvari | 44 Sâdhâraṇa | | | | | |
| 4823 | 1644 | 1779 | 1128 | 896– 97 | 1721-22 | 35 Plava | 45 Virodhakṛit | | | | | |
| 4824 | 1645 | 1780 | 1129 | 897– 98 | 1722-23 | 36 Śubhakṛit | 46 Paridhâvin | 5 Śrâvaṇa | 9759 | 29.277 | 328 | 0.984 |
| 4825 | 1646 | 1781 | 1130 | 898– 99 | 1723-24 | 37 Śobhana | 47 Pramâdin | | | | | |
| 4826 | 1647 | 1782 | 1131 | 899–900 | *1724-25 | 38 Krodhin | 48 Ânanda | | | | | |
| 4827 | 1648 | 1783 | 1132 | 900– 1 | 1725-26 | 39 Viśvâvasu | 49 Râkshasa | 3 Jyeshṭha | 9224 | 27.672 | 4 | 0.012 |
| 4828 | 1649 | 1784 | 1133 | 901– 2 | 1726-27 | 40 Parâbhava | 50 Anala | | | | | |
| 4829 | 1650 | 1785 | 1134 | 902– 3 | 1727-28 | 41 Plavaṅga | 51 Piṅgala | | | | | |
| 4830 | 1651 | 1786 | 1135 | 903– 4 | *1728-29 | 42 Kîlaka | 52 Kâlayukta | 2 Vaiśâkha | 9881 | 29.643 | 280 | 0.840 |
| 4831 | 1652 | 1787 | 1136 | 904– 5 | 1729-30 | 43 Saumya | 53 Siddhârthin | | | | | |
| 4832 | 1653 | 1788 | 1137 | 905– 6 | 1730-31 | 44 Sâdhâraṇa | 54 Raudra | 6 Bhâdrapada | 9796 | 29.388 | 252 | 0.756 |
| 4833 | 1654 | 1789 | 1138 | 906– 7 | 1731-32 | 45 Virodhakṛit | 55 Durmati | | | | | |
| 4834 | 1655 | 1790 | 1139 | 907– 8 | *1732-33 | 46 Paridhâvin | 56 Dundubhi | | | | | |
| 4835 | 1656 | 1791 | 1140 | 908– 9 | 1733-34 | 47 Pramâdin | 57 Rudhirodgârin | 4 Âshâḍha | 9552 | 28.656 | 381 | 1.143 |
| 4836 | 1657 | 1792 | 1141 | 909– 10 | 1734-35 | 48 Ânanda | 58 Raktâksha | | | | | |
| 4837 | 1658 | 1793 | 1142 | 910– 11 | 1735-36 | 49 Râkshasa | 59 Krodhana | | | | | |
| 4838 | 1659 | 1794 | 1143 | 911– 12 | *1736-37 | 50 Anala | 60 Kshaya | 3 Jyeshṭha | 9763 | 29.289 | 458 | 1.374 |
| 4839 | 1660 | 1795 | 1144 | 912– 13 | 1737-38 | 51 Piṅgala | 1 Prabhava | | | | | |
| 4840 | 1661 | 1796 | 1145 | 913– 14 | 1738-39 | 52 Kâlayukta | 2 Vibhava | 7 Âśvina | 9754 | 29.262 | 96 | 0.288 |
| 4841 | 1662 | 1797 | 1146 | 914– 15 | 1739-40 | 53 Siddhârthin | 3 Śukla | | | | | |
| 4842 | 1663 | 1798 | 1147 | 915– 16 | *1740-41 | 54 Raudra | 4 Pramoda | | | | | |
| 4843 | 1664 | 1799 | 1148 | 916– 17 | 1741-42 | 55 Durmati | 5 Prajâpati | 5 Śrâvaṇa | 9892 | 29.676 | 523 | 1.569 |

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

III. COMMENCEMENT OF THE

| Solar year. Day and Month A. D. | Solar year. (Time of the Mesha saṅkrānti) Week day. | By the Ārya Siddhānta Gh. | By the Ārya Siddhānta Pa. | By the Ārya Siddhānta H. | By the Ārya Siddhānta M. | By the Sūrya Siddhānta Gh. | By the Sūrya Siddhānta Pa. | By the Sūrya Siddhānta H. | By the Sūrya Siddhānta M. | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. Moon's Age. Lunar parts elapsed (t) | Tithis elapsed. | a. | b. | c. | Kali. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | 14 | 15 | | 17 | | 15a | | 17a | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 29 Mar. (88).. | 4 Wed. .. | 21 | 52 | 8 | 45 | 27 | 24 | 10 | 58 | 20 Mar. (79).. | 2 Mon. .. | 244 | .732 | 166 | 572 | 254 | 4812 |
| 29 Mar. (88).. | 5 Thur. .. | 37 | 24 | 14 | 57 | 42 | 56 | 17 | 10 | 9 Mar. (68).. | 6 Fri. .... | 252 | .756 | 42 | 419 | 223 | 4813 |
| 28 Mar. (88). | 6 Fri. .... | 52 | 55 | 21 | 10 | 58 | 27 | 23 | 22 | 27 Mar. (87).. | 5 Thur. .. | 327 | .981 | 77 | 355 | 274 | 4814 |
| 29 Mar. (88) | 1 Sun. .... | 8 | 26 | 3 | 22 | 13 | 59 | 5 | 36 | 16 Mar. (76).. | 2 Mon. .. | 226 | .678 | 9952 | 203 | 243 | 4815 |
| 29 Mar. (88). | 2 Mon. ... | 23 | 57 | 9 | 35 | 29 | 30 | 11 | 48 | 5 Mar. (64).. | 6 Fri. .... | 14 | .042 | 9828 | 50 | 212 | 4816 |
| 29 Mar. (88). | 3 Tues. ... | 39 | 29 | 15 | 47 | 45 | 2 | 18 | 1 | 24 Mar. (83).. | 5 Thur. .. | ⊙−16 | −.048 | 9862 | 986 | 264 | 4817 |
| 28 Mar. (88) | 4 Wed. ... | 55 | 0 | 22 | 0 | †0 | 33 | †0 | 13 | 13 Mar. (73).. | 3 Tues. ... | 114 | .342 | 77 | 809 | 236 | 4818 |
| 29 Mar. (88) | 6 Fri. .... | 10 | 31 | 4 | 12 | 16 | 3 | 6 | 26 | 3 Mar. (62).. | 1 Sun. .... | 294 | .882 | 292 | 753 | 207 | 4819 |
| 29 Mar. (88) | 0 Sat. .... | 26 | 2 | 10 | 25 | 31 | 36 | 12 | 38 | 21 Mar. (80).. | 6 Fri. .... | 13 | .039 | 9987 | 652 | 256 | 4820 |
| 29 Mar. (88).. | 1 Sun. .... | 41 | 34 | 16 | 37 | 47 | 8 | 18 | 51 | 11 Mar. (70).. | 4 Wed. ... | 311 | .933 | 202 | 536 | 228 | 4821 |
| 28 Mar. (88). | 2 Mon. ... | 57 | 5 | 22 | 50 | †2 | 39 | †1 | 4 | 28 Mar. (88).. | 2 Mon. .. | 94 | .282 | 9898 | 436 | 276 | 4822 |
| 29 Mar. (88).. | 4 Wed. ... | 12 | 36 | 5 | 2 | 18 | 11 | 7 | 16 | 17 Mar. (76).. | 6 Fri. .... | 51 | .153 | 9774 | 283 | 246 | 4823 |
| 29 Mar. (88). | 5 Thur. .. | 28 | 7 | 11 | 15 | 33 | 43 | 13 | 29 | 7 Mar. (66).. | 4 Wed. ... | 250 | .750 | 9968 | 160 | 218 | 4824 |
| 29 Mar. (88). | 6 Fri. | 43 | 39 | 17 | 27 | 49 | 14 | 19 | 42 | 26 Mar. (85).. | 3 Tues. .. | 247 | .741 | 23 | 102 | 269 | 4825 |
| 28 Mar. (88). | 0 Sat. .... | 59 | 10 | 23 | 40 | †4 | 46 | †1 | 54 | 14 Mar. (74).. | 0 Sat. .... | ⊙−7 | −.021 | 9898 | 949 | 238 | 4826 |
| 29 Mar. (88). | 2 Mon. ... | 14 | 41 | 5 | 52 | 20 | 17 | 8 | 7 | 4 Mar. (63).. | 5 Thur. .. | 133 | .399 | 113 | 833 | 210 | 4827 |
| 29 Mar. (88). | 3 Tues. ... | 30 | 12 | 12 | 5 | 35 | 49 | 14 | 19 | 23 Mar. (82).. | 4 Wed. ... | 148 | .444 | 147 | 769 | 261 | 4828 |
| 29 Mar. (88). | 4 Wed. ... | 45 | 44 | 18 | 17 | 51 | 20 | 20 | 32 | 12 Mar. (71).. | 1 Sun. .... | 99 | .297 | 23 | 616 | 230 | 4829 |
| 29 Mar. (89).. | 6 Fri. .... | 1 | 15 | 0 | 30 | 6 | 52 | 2 | 45 | 29 Feb. (60).. | 5 Thur. .. | 74 | .222 | 9899 | 463 | 200 | 4830 |
| 29 Mar. (88).. | 0 Sat. .... | 16 | 46 | 6 | 42 | 22 | 23 | 8 | 57 | 19 Mar. (78).. | 4 Wed. ... | 158 | .474 | 9933 | 399 | 251 | 4831 |
| 29 Mar. (88).. | 1 Sun. .... | 32 | 17 | 12 | 55 | 37 | 55 | 15 | 10 | 8 Mar. (67).. | 1 Sun. .... | 90 | .270 | 9809 | 247 | 220 | 4832 |
| 29 Mar. (88).. | 2 Mon. ... | 47 | 49 | 19 | 7 | 53 | 26 | 21 | 22 | 27 Mar. (86).. | 0 Sat. .... | 112 | .336 | 9844 | 183 | 272 | 4833 |
| 29 Mar. (89).. | 4 Wed. .. | 3 | 20 | 1 | 20 | 8 | 58 | 3 | 35 | 16 Mar. (76).. | 5 Thur. .. | 255 | .765 | 58 | 66 | 243 | 4834 |
| 29 Mar. (88).. | 5 Thur. .. | 18 | 51 | 7 | 32 | 24 | 29 | 9 | 48 | 5 Mar. (64).. | 2 Mon. ... | 3 | .009 | 9934 | 913 | 213 | 4835 |
| 29 Mar. (88).. | 6 Fri. .... | 34 | 22 | 13 | 45 | 40 | 1 | 16 | 0 | 24 Mar. (83).. | 1 Sun. .... | ⊙−2 | −.006 | 9968 | 849 | 264 | 4836 |
| 29 Mar. (88).. | 0 Sat. .... | 49 | 54 | 19 | 57 | 55 | 32 | 22 | 13 | 14 Mar. (73).. | 6 Fri. .... | 184 | .552 | 183 | 734 | 236 | 4837 |
| 29 Mar. (89).. | 2 Mon. ... | 5 | 25 | 2 | 10 | 11 | 4 | 4 | 26 | 2 Mar. (62).. | 3 Tues. .. | 134 | .402 | 59 | 580 | 205 | 4838 |
| 29 Mar. (88). | 3 Tues. ... | 20 | 56 | 8 | 22 | 26 | 35 | 10 | 38 | 21 Mar. (80).. | 2 Mon. ... | 219 | .657 | 93 | 516 | 256 | 4839 |
| 29 Mar. (88).. | 4 Wed. ... | 36 | 27 | 14 | 35 | 42 | 7 | 16 | 51 | 10 Mar. (69).. | 6 Fri. .... | 215 | .645 | 9969 | 363 | 225 | 4840 |
| 29 Mar. (88).. | 5 Thur. .. | 51 | 59 | 20 | 47 | 57 | 38 | 23 | 3 | 29 Mar. (88).. | 5 Thur. .. | 277 | .831 | 3 | 299 | 277 | 4841 |
| 29 Mar. (89). | 0 Sat. .... | 7 | 30 | 3 | 0 | 13 | 10 | 5 | 16 | 17 Mar. (77).. | 2 Mon. ... | 130 | .390 | 9879 | 146 | 246 | 4842 |
| 29 Mar. (88).. | 1 Sun. ... | 23 | 1 | 9 | 12 | 28 | 41 | 11 | 28 | 7 Mar. (66).. | 0 Sat. .... | 260 | .780 | 93 | 30 | 218 | 4843 |

† See footnote p. liii above. ⊙ See Text Art. 101 above, para. 2.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| Kali. | Saka. | Chaitrâdi. Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | Luni-Solar cycle. (Southern.) | Bṛihaspati cycle (Northern) current at Mesha saṅkrânti. | Name of month | Time of the preceding saṅkrânti expressed in: Lunation parts (*l.*) | Time of the preceding saṅkrânti expressed in: Tithis. | Time of the succeeding saṅkrânti expressed in: Lunation parts (*l.*) | Time of the succeeding saṅkrânti expressed in: Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4844 | 1665 | 1800 | 1149 | 917-18 | 1742-43 | 56 Dundubhi | 6 Angiras | | | | | |
| 4845 | 1666 | 1801 | 1150 | 918-19 | 1743-44 | 57 Rudhirodgârin | 7 Śrîmukha | | | | | |
| 4846 | 1667 | 1802 | 1151 | 919-20 | *1744-45 | 58 Raktâksha | 8 Bhâva | 4 Âshâḍha | 9969 | 29.907 | 839 | 2.517 |
| 4847 | 1668 | 1803 | 1152 | 920-21 | 1745-46 | 59 Krodhana | 9 Yuvan | | | | | |
| 4848 | 1669 | 1804 | 1153 | 921-22 | 1746-47 | 60 Kshaya | 10 Dhâtṛi | | | | | |
| 4849 | 1670 | 1805 | 1154 | 922-23 | 1747-48 | 1 Prabhava | 11 Îśvara | 1 Chaitra | 9837 | 29.511 | 73 | 0.219 |
| 4850 | 1671 | 1806 | 1155 | 923-24 | *1748-49 | 2 Vibhava | 12 Bahudhânya | | | | | |
| 4851 | 1672 | 1807 | 1156 | 924-25 | 1749-50 | 3 Śukla | 13 Pramâthin | 6 Bhâdrapada | 9993 | 29.979 | 404 | 1.212 |
| 4852 | 1673 | 1808 | 1157 | 925-26 | 1750-51 | 4 Pramoda | 14 Vikrama | | | | | |
| 4853 | 1674 | 1809 | 1158 | 926-27 | 1751-52 | 5 Prajâpati | 15 Vṛisha | | | | | |
| 4854 | 1675 | 1810 | 1159 | 927-28 | *1752-53 | 6 Angiras | 16 Chitrabhânu | 4 Âshâḍha | 9509 | 28.527 | 385 | 1.155 |
| 4855 | 1676 | 1811 | 1160 | 928-29 | 1753-54 | 7 Śrîmukha | 17 Subhânu | | | | | |
| 4856 | 1677 | 1812 | 1161 | 929-30 | 1754-55 | 8 Bhâva | 18 Târaṇa | | | | | |
| 4857 | 1678 | 1813 | 1162 | 930-31 | 1755-56 | 9 Yuvan | 19 Pârthiva | 3 Jyeshṭha | 9930 | 29.790 | 509 | 1.527 |
| 4858 | 1679 | 1814 | 1163 | 931-32 | *1756-57 | 10 Dhâtṛi | 20 Vyaya | | | | | |
| 4859 | 1680 | 1815 | 1164 | 932-33 | 1757-58 | 11 Îśvara | 21 Sarvajit | 7 Âśvina | 9878 | 29.634 | 143 | 0.429 |
| 4860 | 1681 | 1816 | 1165 | 933-34 | 1758-59 | 12 Bahudhânya | 22 Sarvadhârin | | | | | |
| 4861 | 1682 | 1817 | 1166 | 934-35 | 1759-60 | 13 Pramâthin | 23 Virodhin | | | | | |
| 4862 | 1683 | 1818 | 1167 | 935-36 | *1760-61 | 14 Vikrama | 24 Vikṛita | 5 Śrâvaṇa | 9924 | 29.772 | 657 | 1.971 |
| 4863 | 1684 | 1819 | 1168 | 936-37 | 1761-62 | 15 Vṛisha | 25 Khara | | | | | |
| 4864 | 1685 | 1820 | 1169 | 937-38 | 1762-63 | 16 Chitrabhânu | 26 Nandana | | | | | |
| 4865 | 1686 | 1821 | 1170 | 938-39 | 1763-64 | 17 Subhânu | 27 Vijaya | 3 Jyeshṭha | 9398 | 28.194 | 5 | 0.015 |
| 4866 | 1687 | 1822 | 1171 | 939-40 | *1764-65 | 18 Târaṇa | 28 Jaya | | | | | |
| 4867 | 1688 | 1823 | 1172 | 940-41 | 1765-66 | 19 Pârthiva | 29 Manmatha | | | | | |
| 4868 | 1689 | 1824 | 1173 | 941-42 | 1766-67 | 20 Vyaya | 30 Durmukha | 1 Chaitra | 9880 | 29.640 | 194 | 0.582 |
| 4869 | 1690 | 1825 | 1174 | 942-43 | 1767-68 | 21 Sarvajit | 31 Hemalamba | | | | | |
| 4870 | 1691 | 1826 | 1175 | 943-44 | *1768-69 | 22 Sarvadhârin | 32 Vilamba | 5 Śrâvaṇa | 9435 | 28.305 | 158 | 0.474 |
| 4871 | 1692 | 1827 | 1176 | 944-45 | 1769-70 | 23 Virodhin | 33 Vikârin | | | | | |
| 4872 | 1693 | 1828 | 1177 | 945-46 | 1770-71 | 24 Vikṛita | 34 Śârvarin | | | | | |
| 4873 | 1694 | 1829 | 1178 | 946-47 | 1771-72 | 25 Khara | 35 Plava [1] | 4 Âshâḍha | 9779 | 29.337 | 342 | 1.026 |
| 4874 | 1695 | 1830 | 1179 | 947-48 | *1772-73 | 26 Nandana | 37 Śobhana | | | | | |
| 4875 | 1696 | 1831 | 1180 | 948-49 | 1773-74 | 27 Vijaya | 38 Krodhin | | | | | |

[1] Śubhakṛit, No. 36, was suppressed in the north.

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

| III. COMMENCEMENT OF THE | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Solar year. | | | | | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | Kali. |
| Day and Month A. D. | (Time of the Mesha saṅkrânti.) Week day. | By the Ârya Siddhânta. Gh. | Pa. | H. | M. | By the Sûrya Siddhânta. Gh. | Pa. | H. | M. | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. Moon's Age. Lunar parts elapsed (t). | Tithis elapsed. | a. | b. | c. | |
| 13 | 14 | 15 | | 17 | | 15a | | 17a | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 29 Mar. (88).. | 2 Mon. ... | 28 | 32 | 15 | 25 | 44 | 13 | 17 | 41 | 26 Mar. (85). | 6 Fri..... | 238 | .714 | 125 | 966 | 260 | 4844 |
| 29 Mar. (88).. | 3 Tues..... | 54 | 4 | 21 | 37 | 59 | 45 | 23 | 54 | 15 Mar. (74).. | 3 Tues.... | 15 | .045 | 4 | 818 | 235 | 4845 |
| 29 Mar. (89).. | 5 Thur. .. | 9 | 35 | 3 | 50 | 15 | 16 | 6 | 6 | 4 Mar. (64).. | 1 Sun .... | 228 | .684 | 218 | 697 | 210 | 4846 |
| 29 Mar. (88).. | 6 Fri...... | 25 | 6 | 10 | 2 | 30 | 48 | 12 | 19 | 23 Mar. (82).. | 0 Sat..... | 290 | .870 | 254 | 633 | 262 | 4847 |
| 29 Mar. (88).. | 0 Sat ..... | 40 | 37 | 16 | 15 | 46 | 19 | 18 | 32 | 12 Mar. (71).. | 4 Wed..... | 287 | .861 | 129 | 480 | 231 | 4848 |
| 29 Mar. (88).. | 1 Sun..... | 56 | 9 | 22 | 27 | 1 | 51 | 0 | 44 | 1 Mar. (60).. | 1 Sun..... | 271 | .813 | 4 | 327 | 200 | 4849 |
| 29 Mar. (89).. | 3 Tues.... | 11 | 40 | 4 | 40 | 17 | 22 | 6 | 57 | 19 Mar. (79).. | 0 Sat...... | 319 | .957 | 39 | 263 | 251 | 4850 |
| 29 Mar. (88).. | 4 Wed..... | 27 | 11 | 10 | 52 | 32 | 54 | 13 | 9 | 8 Mar. (67).. | 4 Wed..... | 146 | .439 | 9915 | 110 | 220 | 4851 |
| 29 Mar. (88).. | 5 Thur.... | 42 | 42 | 17 | 5 | 48 | 25 | 19 | 22 | 27 Mar. (86).. | 3 Tues .... | 129 | .387 | 9949 | 46 | 272 | 4852 |
| 29 Mar. (88).. | 6 Fri...... | 58 | 14 | 23 | 17 | 3 | 57 | 1 | 35 | 17 Mar. (76).. | 1 Sun..... | 244 | .732 | 164 | 980 | 244 | 4853 |
| 29 Mar. (89).. | 1 Sun..... | 13 | 45 | 5 | 30 | 19 | 28 | 7 | 47 | 5 Mar. (65).. | 5 Thur.... | 40 | .120 | 39 | 777 | 213 | 4854 |
| 9 April (99)× | 2 Mon..... | 29 | 16 | 11 | 42 | 35 | 0 | 14 | 0 | 4 April (94)× | 4 Wed .... | 78 | .234 | 74 | 713 | 264 | 4855 |
| 9 April (99).. | 3 Tues.... | 44 | 47 | 17 | 55 | 50 | 31 | 20 | 13 | 24 Mar. (83).. | 1 Sun..... | 38 | .114 | 9950 | 560 | 233 | 4856 |
| 10 April (100). | 5 Thur.... | 0 | 19 | 0 | 7 | 6 | 3 | 2 | 25 | 13 Mar. (72).. | 5 Thur.... | 45 | .135 | 9825 | 407 | 202 | 4857 |
| 9 April (100). | 6 Fri...... | 15 | 50 | 6 | 20 | 21 | 34 | 8 | 38 | 31 Mar. (91).. | 4 Wed .... | 117 | .351 | 9860 | 343 | 254 | 4858 |
| 9 April (99).. | 0 Sat ..... | 31 | 21 | 12 | 32 | 37 | 6 | 14 | 50 | 20 Mar. (79).. | 1 Sun..... | 7 | .021 | 9735 | 190 | 223 | 4859 |
| 9 April (99).. | 1 Sun ..... | 46 | 52 | 18 | 45 | 52 | 37 | 21 | 3 | 8 April (98).. | 0 Sat...... | 10 | .030 | 9770 | 126 | 274 | 4860 |
| 10 April (100). | 3 Tues .... | 2 | 24 | 0 | 57 | 8 | 9 | 3 | 16 | 29 Mar. (88).. | 5 Thur.... | 134 | .402 | 9985 | 10 | 244 | 4861 |
| 9 April (100). | 4 Wed | 17 | 55 | 7 | 10 | 23 | 40 | 9 | 28 | 18 Mar. (78).. | 3 Tues. .. | 252 | .756 | 199 | 893 | 213 | 4862 |
| 9 April (99).. | 5 Thur.... | 33 | 26 | 13 | 22 | 39 | 12 | 15 | 41 | 6 April (96).. | 2 Mon..... | 251 | .753 | 234 | 829 | 265 | 4863 |
| 9 April (99).. | 6 Fri...... | 48 | 57 | 19 | 35 | 54 | 43 | 21 | 53 | 26 Mar. (85).. | 6 Fri..... | 123 | .369 | 109 | 677 | 239 | 4864 |
| 10 April (100). | 1 Sun..... | 4 | 29 | 1 | 47 | 10 | 15 | 4 | 6 | 15 Mar. (74).. | 3 Tues.... | 6 | .018 | 9985 | 524 | 205 | 4865 |
| 9 April (100). | 2 Mon..... | 20 | 0 | 8 | 0 | 25 | 47 | 10 | 19 | 3 April (93) . | 2 Mon..... | 195 | .585 | 20 | 460 | 259 | 4866 |
| 9 April (99).. | 3 Tues .... | 35 | 31 | 14 | 12 | 41 | 18 | 16 | 31 | 23 Mar. (81).. | 6 Fri..... | 167 | .501 | 9896 | 307 | 228 | 4867 |
| 9 April (99).. | 4 Wed .... | 51 | 2 | 20 | 25 | 56 | 50 | 22 | 43 | 11 Mar. (70).. | 3 Tues.... | 29 | .087 | 9771 | 154 | 197 | 4868 |
| 10 April (100). | 6 Fri...... | 6 | 34 | 2 | 37 | 12 | 21 | 4 | 50 | 30 Mar. (89).. | 2 Mon..... | 21 | .063 | 9806 | 90 | 249 | 4869 |
| 9 April (100). | 0 Sat ..... | 22 | 5 | 8 | 50 | 27 | 53 | 11 | 9 | 19 Mar. (79).. | 0 Sat...... | 138 | .414 | 20 | 974 | 221 | 4870 |
| 9 April (99).. | 1 Sun..... | 37 | 36 | 15 | 2 | 43 | 24 | 17 | 22 | 7 April (97).. | 6 Fri..... | 120 | .360 | 55 | 910 | 272 | 4871 |
| 9 April (99).. | 2 Mon.... | 53 | 7 | 21 | 15 | 58 | 56 | 23 | 34 | 28 Mar. (87).. | 4 Wed.... | 274 | .822 | 209 | 793 | 244 | 4872 |
| 10 April (100) | 4 Wed .... | 8 | 39 | 3 | 27 | 14 | 27 | 5 | 47 | 17 Mar. (76).. | 1 Sun..... | 179 | .537 | 145 | 640 | 213 | 4873 |
| 9 April (100). | 5 Thur.... | 24 | 10 | 9 | 40 | 29 | 59 | 11 | 59 | 4 April (95).. | 0 Sat...... | 255 | .765 | 180 | 576 | 264 | 4874 |
| 9 April (99). | 6 Fri...... | 39 | 41 | 15 | 52 | 45 | 30 | 18 | 12 | 24 Mar. (83).. | 4 Wed. | 260 | .780 | 55 | 424 | 233 | 4875 |

† See footnote p. liii above. × From here (inclusive) forward the dates are New Style.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| Kali. | Śaka. | Chaitrâdi Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | Luni-Solar cycle (Southern.) | Bṛihaspati cycle (Northern) current at Mesha saṅkrânti. | Name of month. | Time of the preceding saṅkrânti expressed in Lunation parts (t.) | Time of the preceding saṅkrânti expressed in Tithis. | Time of the succeeding saṅkrânti expressed in Lunation parts (t.) | Time of the succeeding saṅkrânti expressed in Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4876 | 1697 | 1832 | 1181 | 949-50 | 1774- 75 | 28 Jaya........ | 39 Viśvâvasu. | 2 Vaiśâkha. | 9690 | 29.068 | 124 | 0.372 |
| 4877 | 1698 | 1833 | 1182 | 950-51 | 1775- 76 | 29 Manmatha.... | 40 Parâbhava. | | | | | |
| 4878 | 1699 | 1834 | 1183 | 951-52 | *1776- 77 | 30 Durmukha.... | 41 Plavaṅga. | 6 Bhâdrapada. | 9612 | 28.836 | 67 | 0.201 |
| 4879 | 1700 | 1835 | 1184 | 952-53 | 1777- 78 | 31 Hemalamba. . | 42 Kîlaka. | | | | | |
| 4880 | 1701 | 1836 | 1185 | 953-54 | 1778- 79 | 32 Vilamba..... | 43 Saumya. | | | | | |
| 4881 | 1702 | 1837 | 1186 | 954-55 | 1779- 80 | 33 Vikârin...... | 44 Sâdhâraṇa. | 5 Śrâvaṇa... | 9972 | 29.916 | 690 | 2.070 |
| 4882 | 1703 | 1838 | 1187 | 955-56 | *1780- 81 | 34 Śârvari...... | 45 Virodhakṛit. | | | | | |
| 4883 | 1704 | 1839 | 1188 | 956-57 | 1781- 82 | 35 Plava......... | 46 Paridhâvin. | | | | | |
| 4884 | 1705 | 1840 | 1189 | 957-58 | 1782- 83 | 36 Śubhakṛit.... | 47 Pramâdin. | 3 Jyeshṭha .. | 9593 | 28.779 | 142 | 0.426 |
| 4885 | 1706 | 1841 | 1190 | 958-59 | 1783- 84 | 37 Śobhana.... | 48 Ânanda. | | | | | |
| 4886 | 1707 | 1842 | 1191 | 959-60 | *1784- 85 | 38 Krodhin..... | 49 Râkshasa. | | | | | |
| 4887 | 1708 | 1843 | 1192 | 960-61 | 1785- 86 | 39 Viśvâvasu.... | 50 Anala. | 1 Chaitra.... | 9855 | 29.565 | 217 | 0.651 |
| 4888 | 1709 | 1844 | 1193 | 961-62 | 1786- 87 | 40 Parâbhava.. | 51 Piṅgala. | | | | | |
| 4889 | 1710 | 1845 | 1194 | 962-63 | 1787- 88 | 41 Plavaṅga..... | 52 Kâlayukta. | 5 Śrâvaṇa.... | 9433 | 28.299 | 221 | 0.663 |
| 4890 | 1711 | 1846 | 1195 | 963-64 | *1788- 89 | 42 Kîlaka ..... | 53 Siddhârthin. | | | | | |
| 4891 | 1712 | 1847 | 1196 | 964-65 | 1789- 90 | 43 Saumya ..... | 54 Raudra. | | | | | |
| 4892 | 1713 | 1848 | 1197 | 965-66 | 1790- 91 | 44 Sâdhâraṇa... | 55 Durmati. | 4 Âshâḍha. | 9650 | 28.950 | 344 | 1.032 |
| 4893 | 1714 | 1849 | 1198 | 966-67 | 1791- 92 | 45 Virodhakṛit... | 56 Dundubhi. | | | | | |
| 4894 | 1715 | 1850 | 1199 | 967-68 | *1792- 93 | 46 Paridhâvin... | 57 Rudhirodgârin. | | | | | |
| 4895 | 1716 | 1851 | 1200 | 968-69 | 1793- 94 | 47 Pramâdin.... | 58 Raktâksha. | 2 Vaiśâkha... | 9751 | 29.253 | 268 | 0.804 |
| 4896 | 1717 | 1852 | 1201 | 969-70 | 1794- 95 | 48 Ânanda..... | 59 Krodhana. | | | | | |
| 4897 | 1718 | 1853 | 1202 | 970-71 | 1795- 96 | 49 Râkshasa..... | 60 Kshaya. | 6 Bhâdrapada. | 9743 | 29.229 | 244 | 0.732 |
| 4898 | 1719 | 1854 | 1203 | 971-72 | *1796- 97 | 50 Anala....... | 1 Prabhava. | | | | | |
| 4899 | 1720 | 1855 | 1204 | 972-73 | 1797- 98 | 51 Piṅgala..... | 2 Vibhava. | | | | | |
| 4900 | 1721 | 1856 | 1205 | 973-74 | 1798- 99 | 52 Kâlayukta.... | 3 Śukla. | 5 Śrâvaṇa. | 9866 | 29.598 | 654 | 1.962 |
| 4901 | 1722 | 1857 | 1206 | 974-75 | 1799-800 | 53 Siddhârthin... | 4 Pramoda. | | | | | |
| 4902 | 1723 | 1858 | 1207 | 975-76 | 1800†- 1 | 54 Raudra...... | 5 Prajâpati. | | | | | |
| 4903 | 1724 | 1859 | 1208 | 976-77 | 1801- 2 | 55 Durmati..... | 6 Âṅgiras. | 3 Jyeshṭha. | 9760 | 29.280 | 233 | 0.699 |
| 4904 | 1725 | 1860 | 1209 | 977-78 | 1802- 3 | 56 Dundubhi.... | 7 Śrîmukha. | | | | | |
| 4905 | 1726 | 1861 | 1210 | 978-79 | 1803- 4 | 57 Rudhirodgârin | 8 Bhâva. | | | | | |
| 4906 | 1727 | 1862 | 1211 | 979-80 | *1804- 5 | 58 Raktâksha.... | 9 Yuvan. | 1 Chaitra.... | 9228 | 27.684 | 178 | 0.534 |
| 4907 | 1728 | 1863 | 1212 | 980-81 | 1805- 6 | 59 Krodhana.... | 10 Dhâtri... | | | | | |

† The year 1800 was not a leap-year.

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

III. COMMENCEMENT OF THE

| Solar year. Day and Month A. D. | Solar year. (Time of the Mesha saṁkrânti.) Week day. | By the Ârya Siddhânta. Gh. | Pa. | H. | M. | By the Sûrya Siddhânta. Gh. | Pa. | H. | M. | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. Moon's Age. Lunar. parts elapsed. (t.) | Tithis elapsed. | a. | b. | c. | Kali. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | 14 | 15 | | 17 | | 15a | | 17a | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 9 April (99). . | 0 Sat. . . . . | 35 | 12 | 22 | 5 | †1 | 2 | †0 | 23 | 13 Mar. (72). | 1 Sun. . . | 213 | .639 | 9931 | 271 | 203 | 4876 |
| 10 April (100). | 2 Mon. . . . | 10 | 44 | 4 | 17 | 16 | 43 | 6 | 37 | 1 April (91). . | 0 Sat. . . . | 241 | .723 | 9966 | 207 | 254 | 4877 |
| 9 April (100). | 3 Tues. . . . | 26 | 15 | 10 | 30 | 32 | 5 | 12 | 50 | 20 Mar. (80). | 4 Wed. . . . | 29 | .087 | 9841 | 54 | 225 | 4878 |
| 9 April (99). | 4 Wed. . . . | 41 | 46 | 16 | 42 | 47 | 36 | 19 | 3 | 8 April (98). . | 3 Tues. . . | 8 | .024 | 9876 | 990 | 275 | 4879 |
| 9 April (99). | 5 Thur. . . | 57 | 17 | 22 | 55 | †3 | 8 | †1 | 15 | 29 Mar. (88). . | 1 Sun. . . . | 130 | .390 | 90 | 874 | 246 | 4880 |
| 10 April (100). | 0 Sat. . . . | 12 | 49 | 5 | 7 | 18 | 39 | 7 | 28 | 19 Mar. (78). . | 6 Fri. . . . | 306 | .918 | 305 | 757 | 218 | 4881 |
| 9 April (100). | 1 Sun. . . . | 28 | 20 | 11 | 20 | 34 | 11 | 13 | 40 | 6 April (96). . | 4 Wed. . . . | 24 | .072 | 1 | 657 | 267 | 4882 |
| 9 April (99). . | 2 Mon. . . . | 43 | 51 | 17 | 32 | 49 | 42 | 19 | 53 | 25 Mar. (84). . | 1 Sun. . . . | 12 | .036 | 9876 | 504 | 236 | 4883 |
| 9 April (99). . | 3 Tues. . . . | 59 | 22 | 23 | 45 | †5 | 14 | †2 | 6 | 14 Mar. (73). . | 5 Thur. . . | 8 | .024 | 9752 | 351 | 205 | 4884 |
| 10 April (100). | 5 Thur. . . | 14 | 54 | 5 | 57 | 20 | 45 | 8 | 18 | 2 April (92). . | 4 Wed. . . . | 63 | .189 | 9787 | 287 | 256 | 4885 |
| 9 April (100). | 6 Fri. . . . | 30 | 25 | 12 | 10 | 36 | 17 | 14 | 31 | 22 Mar. (82). . | 2 Mon. . . . | 264 | .792 | 1 | 171 | 228 | 4886 |
| 9 April (99). . | 0 Sat. . . . | 45 | 56 | 18 | 22 | 51 | 49 | 20 | 43 | 11 Mar. (70). . | 6 Fri. . . . | 36 | .108 | 9877 | 18 | 198 | 4887 |
| 10 April (100). | 2 Mon. . . . | 1 | 27 | 0 | 35 | 7 | 20 | 2 | 56 | 30 Mar. (89). . | 5 Thur. . . | 11 | .033 | 9911 | 954 | 249 | 4888 |
| 10 April (100). | 3 Tues. . . . | 16 | 58 | 6 | 47 | 22 | 52 | 9 | 9 | 20 Mar. (79). . | 3 Tues. . . . | 148 | .444 | 126 | 837 | 221 | 4889 |
| 9 April (100). | 4 Wed. . . . | 32 | 30 | 13 | 0 | 38 | 23 | 15 | 21 | 7 April (98). . | 2 Mon. . . . | 163 | .489 | 161 | 773 | 272 | 4890 |
| 9 April (99). . | 5 Thur. . . | 48 | 1 | 19 | 12 | 53 | 55 | 21 | 34 | 27 Mar. (86). . | 6 Fri. . . . | 79 | .237 | 36 | 621 | 241 | 4891 |
| 10 April (100). | 0 Sat. . . . | 3 | 32 | 1 | 25 | 9 | 26 | 3 | 46 | 16 Mar. (75). . | 3 Tues. . . . | 82 | .246 | 9912 | 468 | 211 | 4892 |
| 10 April (100). | 1 Sun. . . . | 19 | 4 | 7 | 37 | 24 | 58 | 9 | 59 | 4 April (94). . | 2 Mon. . . . | 167 | .501 | 9947 | 404 | 262 | 4893 |
| 9 April (100). | 2 Mon. . . . | 34 | 35 | 13 | 50 | 40 | 29 | 16 | 12 | 23 Mar. (83). . | 6 Fri. . . . | 102 | .306 | 9822 | 251 | 231 | 4894 |
| 9 April (99). . | 3 Tues. . . . | 50 | 6 | 20 | 2 | 56 | 1 | 22 | 24 | 13 Mar. (72). . | 4 Wed. . . . | 284 | .852 | 57 | 134 | 203 | 4895 |
| 10 April (100). | 5 Thur. . . | 5 | 37 | 2 | 15 | 11 | 32 | 4 | 37 | 1 April (91). . | 3 Tues. . . . | 271 | .813 | 71 | 70 | 254 | 4896 |
| 10 April (100). | 6 Fri. . . . | 21 | 8 | 8 | 27 | 27 | 4 | 10 | 49 | 21 Mar. (80). | 0 Sat. . . . | 19 | .057 | 9947 | 918 | 223 | 4897 |
| 9 April (100). | 0 Sat. . . . | 36 | 40 | 14 | 40 | 42 | 35 | 17 | 2 | 8 April (99). . | 6 Fri. . . . | 12 | .036 | 9982 | 854 | 275 | 4898 |
| 9 April (99). . | 1 Sun. . . . | 52 | 11 | 20 | 52 | 58 | 7 | 23 | 15 | 29 Mar. (88). . | 4 Wed. . . . | 196 | .588 | 196 | 737 | 247 | 4899 |
| 10 April (100). | 3 Tues. . . . | 7 | 42 | 3 | 5 | 13 | 38 | 5 | 27 | 18 Mar. (77). . | 1 Sun. . . . | 142 | .426 | 72 | 684 | 216 | 4900 |
| 10 April (100). | 4 Wed. . . . | 23 | 14 | 9 | 17 | 29 | 10 | 11 | 40 | 6 April (96). . | 0 Sat. . . . | 228 | .684 | 106 | 520 | 267 | 4901 |
| 10 April (100). | 5 Thur. . . | 38 | 45 | 15 | 30 | 44 | 41 | 17 | 53 | 26 Mar. (85). . | 4 Wed. . . . | 225 | .675 | 9982 | 368 | 236 | 4902 |
| 10 April (100). | 6 Fri. . . . | 54 | 16 | 21 | 42 | †0 | 13 | †0 | 5 | 15 Mar. (74). . | 1 Sun. . . . | 137 | .411 | 9858 | 215 | 205 | 4903 |
| 11 April (101). | 1 Sun. . . . | 9 | 47 | 3 | 55 | 15 | 44 | 6 | 18 | 3 April (93). | 0 Sat. . . . | 146 | .438 | 9892 | 151 | 257 | 4904 |
| 11 April (101). | 2 Mon. . . . | 25 | 19 | 10 | 7 | 31 | 16 | 12 | 30 | 24 Mar. (83). | 5 Thur. . . | 277 | .831 | 107 | 34 | 229 | 4905 |
| 10 April (101). | 3 Tues. . . . | 40 | 50 | 16 | 20 | 46 | 47 | 18 | 43 | 12 Mar. (72). . | 2 Mon. . . . | 30 | .090 | 9982 | 882 | 198 | 4906 |
| 10 April (100). | 4 Wed. . . . | 56 | 21 | 22 | 32 | †2 | 19 | †0 | 55 | 31 Mar. (90). | 1 Sun. . . . | 29 | .087 | 17 | 817 | 249 | 4907 |

† See footnote p. liii above.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara | | True. | | | | |
| Kali. | Saka. | Chaitrâdi. Vikrama. | Mouldâli (Solar) year in Bengal. | Kollam. | A. D. | Luni-Solar cycle. (Southern.) | Brihaspati cycle (Northern) current at Mesha sankrânti. | Name of month. | Time of the preceding sankrânti expressed in: Lunation parts. (t.) | Tithis. | Time of the succeeding sankrânti expressed in: Lunation parts. (t.) | Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4908 | 1729 | 1864 | 1213 | 981–82 | 1806–7 | 60 Kshaya | 11 Îśvara | 5 Śrâvaṇa | 9398 | 28.194 | 305 | 0.915 |
| 4909 | 1730 | 1865 | 1214 | 982–83 | 1807–8 | 1 Prabhava | 12 Bahudhânya | | | | | |
| 4910 | 1731 | 1866 | 1215 | 983–84 | *1808–9 | 2 Vibhava | 13 Pramâthin | | | | | |
| 4911 | 1732 | 1867 | 1216 | 984–85 | 1809–10 | 3 Śukla | 14 Vikrama | 4 Âshâḍha | 9799 | 29.397 | 438 | 1.314 |
| 4912 | 1733 | 1868 | 1217 | 985–86 | 1810–11 | 4 Pramoda | 15 Vrisha | | | | | |
| 4913 | 1734 | 1869 | 1218 | 986–87 | 1811–12 | 5 Prajâpati | 16 Chitrabhânu | | | | | |
| 4914 | 1735 | 1870 | 1219 | 987–88 | *1812–13 | 6 Aṅgiras | 17 Subhânu | 2 Vaiśâkha | 9726 | 29.178 | 308 | 0.924 |
| 4915 | 1736 | 1871 | 1220 | 988–89 | 1813–14 | 7 Śrîmukha | 18 Târaṇa | | | | | |
| 4916 | 1737 | 1872 | 1221 | 989–90 | 1814–15 | 8 Bhâva | 19 Pârthiva | 6 Bhâdrapada | 9748 | 29.244 | 336 | 1.008 |
| 4917 | 1738 | 1873 | 1222 | 990–91 | 1815–16 | 9 Yuvan | 20 Vyaya | | | | | |
| 4918 | 1739 | 1874 | 1223 | 991–92 | *1816–17 | 10 Dhâtri | 21 Sarvajit | | | | | |
| 4919 | 1740 | 1875 | 1224 | 992–93 | 1817–18 | 11 Îśvara | 22 Sarvadhârin | 5 Śrâvaṇa | 9926 | 29.778 | 731 | 2.193 |
| 4920 | 1741 | 1876 | 1225 | 993–94 | 1818–19 | 12 Bahudhânya | 23 Virodhin | | | | | |
| 4921 | 1742 | 1877 | 1226 | 994–95 | 1819–20 | 13 Pramâthin | 24 Vikṛita | | | | | |
| 4922 | 1743 | 1878 | 1227 | 995–96 | *1820–21 | 14 Vikrama | 25 Khara | 3 Jyeshṭha | 9838 | 29.514 | 501 | 1.503 |
| 4923 | 1744 | 1879 | 1228 | 996–97 | 1821–22 | 15 Vrisha | 26 Nandana | | | | | |
| 4924 | 1745 | 1880 | 1229 | 997–98 | 1822–23 | 16 Chitrabhânu | 27 Vijaya | 7 Âśvina<br>10 *Pausha (Ksh.)* | 9848<br>74 | 29.544<br>0.222 | 127<br>9918 | 0.381<br>29.754 |
| 4925 | 1746 | 1881 | 1230 | 998–99 | 1823–24 | 17 Subhânu | 28 Jaya | 1 Chaitra | 9870 | 29.610 | 161 | 0.483 |
| 4926 | 1747 | 1882 | 1231 | 999–1000 | *1824–25 | 18 Târaṇa | 29 Manmatha | | | | | |
| 4927 | 1748 | 1883 | 1232 | 1000–1 | 1825–26 | 19 Pârthiva | 30 Durmukha | 5 Śrâvaṇa | 9427 | 28.281 | 166 | 0.498 |
| 4928 | 1749 | 1884 | 1233 | 1001–2 | 1826–27 | 20 Vyaya | 31 Hemalamba | | | | | |
| 4929 | 1750 | 1885 | 1234 | 1002–3 | 1827–28 | 21 Sarvajit | 32 Vilamba | | | | | |
| 4930 | 1751 | 1886 | 1235 | 1003–4 | *1828–29 | 22 Sarvadhârin | 33 Vikârin | 4 Âshâḍha | 9984 | 29.952 | 615 | 1.845 |
| 4931 | 1752 | 1887 | 1236 | 1004–5 | 1829–30 | 23 Virodhin | 34 Śârvari | | | | | |
| 4932 | 1753 | 1888 | 1237 | 1005–6 | 1830–31 | 24 Vikṛita | 35 Plava | | | | | |
| 4933 | 1754 | 1889 | 1238 | 1006–7 | 1831–32 | 25 Khara | 36 Śubhakṛit | 2 Vaiśâkha | 9653 | 28.959 | 277 | 0.831 |
| 4934 | 1755 | 1890 | 1239 | 1007–8 | *1832–33 | 26 Nandana | 37 Śobhana | | | | | |
| 4935 | 1756 | 1891 | 1240 | 1008–9 | 1833–34 | 27 Vijaya | 38 Krodhin | 6 Bhâdrapada | 9707 | 29.121 | 335 | 1.005 |
| 4936 | 1757 | 1892 | 1241 | 1009–10 | 1834–35 | 28 Jaya | 39 Viśvâvasu | | | | | |
| 4937 | 1758 | 1893 | 1242 | 1010–11 | 1835–36 | 29 Manmatha | 40 Parâbhava | | | | | |
| 4938 | 1759 | 1894 | 1243 | 1011–12 | *1836–37 | 30 Durmukha | 41 Plavaṅga | 4 Âshâḍha | 9460 | 28.380 | 251 | 0.753 |

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

## III. COMMENCEMENT OF THE

| Solar year. | | | | | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | Kali. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Day and Month A. D. | (Time of the Mesha saṅkrānti.) | | | | | | | | | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain | | | | | |
| | Week day. | By the Ārya Siddhānta. | | | | By the Sūrya Siddhānta. | | | | | | Moon's Age. | | a. | b. | c. | |
| | | Gh. | Pa. | H. | M. | Gh. | Pa. | H. | M. | | | Lunar parts elapsed. (t.) | Tithis elapsed. | | | | |
| 13 | 14 | 15 | | 17 | | 15a | | 17a | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 11 April (101). | 6 Fri.... | 11 | 32 | 4 | 45 | 17 | 50 | 7 | 8 | 21 Mar. (80).. | 6 Fri..... | 239 | .717 | 231 | 701 | 221 | 4908 |
| 11 April (101). | 0 Sat. ... | 27 | 24 | 10 | 57 | 33 | 22 | 13 | 21 | 9 April (99).. | 5 Thur.. | 300 | .900 | 266 | 637 | 272 | 4909 |
| 10 April (101). | 1 Sun.... | 42 | 55 | 17 | 10 | 48 | 54 | 19 | 33 | 28 Mar. (88).. | 2 Mon.... | 296 | .888 | 142 | 484 | 242 | 4910 |
| 10 April (101). | 2 Mon.... | 58 | 26 | 23 | 22 | †4 | 25 | †1 | 46 | 17 Mar. (76).. | 6 Fri..... | 281 | .843 | 17 | 332 | 211 | 4911 |
| 11 April (101). | 4 Wed... | 13 | 57 | 5 | 35 | 19 | 57 | 7 | 59 | 5 April (95).. | 5 Thur... | 331 | .993 | 52 | 267 | 282 | 4912 |
| 11 April (101). | 5 Thur. .. | 29 | 29 | 11 | 47 | 35 | 28 | 14 | 11 | 25 Mar. (84).. | 2 Mon.... | 161 | .483 | 9926 | 115 | 231 | 4913 |
| 10 April (101). | 6 Fri.... | 45 | 0 | 18 | 0 | 51 | 0 | 20 | 24 | 14 Mar. (74).. | 0 Sat..... | 283 | .849 | 142 | 996 | 203 | 4914 |
| 11 April (101). | 1 Sun.... | 0 | 31 | 0 | 12 | 6 | 31 | 2 | 36 | 2 April (92).. | 6 Fri.... | 260 | .780 | 177 | 934 | 254 | 4915 |
| 11 April (101). | 2 Mon.... | 16 | 2 | 6 | 25 | 22 | 3 | 8 | 49 | 22 Mar. (81).. | 3 Tues.... | 57 | .171 | 53 | 781 | 224 | 4916 |
| 11 April (101). | 3 Tues.. | 31 | 34 | 12 | 37 | 37 | 34 | 15 | 2 | 10 April (100). | 2 Mon.... | 91 | .273 | 67 | 717 | 275 | 4917 |
| 10 April (101). | 4 Wed.... | 47 | 5 | 18 | 50 | 53 | 6 | 21 | 14 | 29 Mar. (89).. | 0 Fri..... | 48 | .144 | 9963 | 564 | 244 | 4918 |
| 11 April (101). | 6 Fri..... | 3 | 36 | 1 | 2 | 8 | 37 | 3 | 27 | 18 Mar. (77).. | 3 Tues.... | 55 | .165 | 9839 | 412 | 213 | 4919 |
| 11 April (101). | 0 Sat. .. | 18 | 7 | 7 | 15 | 24 | 9 | 9 | 40 | 6 April (96).. | 2 Mon ... | 127 | .381 | 9873 | 348 | 265 | 4920 |
| 11 April (101). | 1 Sun.... | 33 | 39 | 13 | 27 | 39 | 40 | 15 | 52 | 26 Mar. (85).. | 6 Fri..... | 21 | .063 | 9749 | 195 | 234 | 4921 |
| 10 April (101). | 2 Mon ... | 49 | 10 | 19 | 40 | 55 | 12 | 22 | 5 | 15 Mar. (75).. | 4 Wed. .. | 171 | .513 | 9963 | 76 | 206 | 4922 |
| 11 April (101). | 4 Wed.... | 4 | 41 | 1 | 52 | 10 | 43 | 4 | 17 | 3 April (93).. | 3 Tues.... | 151 | .453 | 9998 | 14 | 257 | 4923 |
| 11 April (101). | 5 Thur.. | 20 | 12 | 8 | 5 | 26 | 15 | 10 | 30 | 24 Mar. (83).. | 1 Sun.... | 268 | .804 | 212 | 899 | 229 | 4924 |
| 11 April (101). | 6 Fri..... | 35 | 44 | 14 | 17 | 41 | 46 | 16 | 42 | 13 Mar. (72).. | 5 Thur... | 91 | .273 | 69 | 746 | 197 | 4925 |
| 10 April (101). | 0 Sat..... | 51 | 15 | 20 | 30 | 57 | 18 | 22 | 55 | 31 Mar. (91).. | 4 Wed ... | 135 | .405 | 123 | 682 | 248 | 4926 |
| 11 April (101). | 2 Mon.... | 6 | 46 | 2 | 42 | 12 | 49 | 5 | 8 | 20 Mar. (79).. | 1 Sun.... | 114 | .342 | 9998 | 529 | 218 | 4927 |
| 11 April (101). | 3 Tues.... | 22 | 17 | 8 | 55 | 28 | 21 | 11 | 20 | 8 April (98).. | 0 Sat..... | 203 | .609 | 33 | 465 | 269 | 4928 |
| 11 April (101). | 4 Wed.... | 37 | 49 | 15 | 7 | 43 | 52 | 17 | 33 | 28 Mar. (87).. | 4 Wed.... | 178 | .534 | 9909 | 312 | 238 | 4929 |
| 10 April (101). | 5 Thur.... | 53 | 20 | 21 | 20 | 59 | 24 | 23 | 46 | 16 Mar. (76).. | 1 Sun.... | 44 | .132 | 9784 | 160 | 207 | 4930 |
| 11 April (101). | 0 Sat..... | 8 | 51 | 3 | 32 | 14 | 56 | 5 | 58 | 4 April (94).. | 0 Sat..... | 39 | .117 | 9819 | 96 | 259 | 4931 |
| 11 April (101). | 1 Sun.... | 24 | 22 | 9 | 45 | 30 | 27 | 12 | 11 | 25 Mar. (84).. | 5 Thur... | 154 | .462 | 33 | 979 | 230 | 4932 |
| 11 April (101). | 2 Mon.... | 39 | 54 | 15 | 57 | 45 | 59 | 18 | 23 | 15 Mar. (74).. | 3 Tues.... | 284 | .852 | 248 | 863 | 202 | 4933 |
| 10 April (101). | 3 Tues.. | 55 | 25 | 22 | 10 | †1 | 30 | †0 | 36 | 2 April (93).. | 2 Mon.... | 289 | .867 | 282 | 799 | 254 | 4934 |
| 11 April (101). | 5 Thur... | 10 | 56 | 4 | 22 | 17 | 2 | 6 | 49 | 22 Mar. (81).. | 6 Fri.... | 188 | .564 | 158 | 646 | 223 | 4935 |
| 11 April (101). | 6 Fri..... | 26 | 27 | 10 | 35 | 32 | 33 | 13 | 1 | 10 April (100). | 5 Thur.. | 264 | .792 | 193 | 582 | 274 | 4936 |
| 11 April (101). | 0 Sat..... | 41 | 59 | 16 | 47 | 48 | 5 | 19 | 14 | 30 Mar. (89).. | 2 Mon.... | 270 | .810 | 69 | 429 | 243 | 4937 |
| 10 April (101). | 1 Sun.... | 57 | 30 | 23 | 0 | †3 | 36 | †1 | 26 | 18 Mar. (78).. | 6 Fri..... | 225 | .675 | 9945 | 276 | 213 | 4938 |

† See footnote p. liii above.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| | | | | | | | | | Time of the preceding saṅkrânti expressed in | | Time of the succeeding saṅkrânti expressed in | |
| Kali. | Saka. | Chaitrâdi. Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | Luni-Solar cycle (Southern.) | Brihaspati cycle (Northern) current at Mesha saṅkrânti. | Name of month. | Lunation parts. (l.) | Tithis. | Lunation parts. (l.) | Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4939 | 1760 | 1895 | 1244 | 1012-13 | 1837-38 | 31 Hemalamba | 42 Kîlaka | | | | | |
| 4940 | 1761 | 1896 | 1245 | 1013-14 | 1838-39 | 32 Vilamba | 43 Saumya | | | | | |
| 4941 | 1762 | 1897 | 1246 | 1014-15 | 1839-40 | 33 Vikârin | 44 Sâdhârana | 3 Jyeshtha | 9826 | 29.478 | 581 | 1.743 |
| 4942 | 1763 | 1898 | 1247 | 1015-16 | *1840-41 | 34 Sârvari | 45 Virodhakrit | | | | | |
| 4943 | 1764 | 1899 | 1248 | 1016-17 | 1841-42 | 35 Plava | 46 Paridhâvin | 7 Âsvina | 9876 | 29.628 | 232 | 0.696 |
| 4944 | 1765 | 1900 | 1249 | 1017-18 | 1842-43 | 36 Subhakrit | 47 Pramâdin | | | | | |
| 4945 | 1766 | 1901 | 1250 | 1018-19 | 1843-44 | 37 Sobhana | 48 Ânanda | | | | | |
| 4946 | 1767 | 1902 | 1251 | 1019-20 | *1844-45 | 38 Krodhin | 49 Râkshasa | 5 Srâvana | 9554 | 28.662 | 155 | 0.465 |
| 4947 | 1768 | 1903 | 1252 | 1020-21 | 1845-46 | 39 Visvâvasu | 50 Anala | | | | | |
| 4948 | 1769 | 1904 | 1253 | 1021-22 | 1846-47 | 40 Parâbhava | 51 Pingala | | | | | |
| 4949 | 1770 | 1905 | 1254 | 1022-23 | 1847-48 | 41 Plavanga | 52 Kâlayukta | 3 Jyeshtha | 9368 | 28.104 | 98 | 0.294 |
| 4950 | 1771 | 1906 | 1255 | 1023-24 | *1848-49 | 42 Kîlaka | 53 Siddhârthin | | | | | |
| 4951 | 1772 | 1907 | 1256 | 1024-25 | 1849-50 | 43 Saumya | 54 Raudra | | | | | |
| 4952 | 1773 | 1908 | 1257 | 1025-26 | 1850-51 | 44 Sâdhârana | 55 Durmati | 2 Vaisâkha | 9729 | 29.187 | 248 | 0.744 |
| 4953 | 1774 | 1909 | 1258 | 1026-27 | 1851-52 | 45 Virodhakrit | 56 Dundubhi | | | | | |
| 4954 | 1775 | 1910 | 1259 | 1027-28 | *1852-53 | 46 Paridhâvin | 57 Rudhirodgârin | 6 Bhâdrapada | 9713 | 29.139 | 293 | 0.879 |
| 4955 | 1776 | 1911 | 1260 | 1028-29 | 1853-54 | 47 Pramâdin | 58 Raktâksha | | | | | |
| 4956 | 1777 | 1912 | 1261 | 1029-30 | 1854-55 | 48 Ânanda | 59 Krodhana | | | | | |
| 4957 | 1778 | 1913 | 1262 | 1030-31 | 1855-56 | 49 Râkshasa | 60 Kshaya | 4 Âshâdha | 9612 | 28.836 | 277 | 0.831 |
| 4958 | 1779 | 1914 | 1263 | 1031-32 | *1856-57 | 50 Anala | 1 Prabhava [1] | | | | | |
| 4959 | 1780 | 1915 | 1264 | 1032-33 | 1857-58 | 51 Pingala | 3 Sukla | | | | | |
| 4960 | 1781 | 1916 | 1265 | 1033-34 | 1858-59 | 52 Kâlayukta | 4 Pramoda | 3 Jyeshtha | 9783 | 29.349 | 568 | 1.704 |
| 4961 | 1782 | 1917 | 1266 | 1034-35 | 1859-60 | 53 Siddhârthin | 5 Prajâpati | | | | | |
| 4962 | 1783 | 1918 | 1267 | 1035-36 | *1860-61 | 54 Raudra | 6 Aṅgiras | 7 Âsvina | 9845 | 29.535 | 242 | 0.726 |
| 4963 | 1784 | 1919 | 1268 | 1036-37 | 1861-62 | 55 Durmati | 7 Srîmukha | | | | | |
| 4964 | 1785 | 1920 | 1269 | 1037-38 | 1862-63 | 56 Dundubhi | 8 Bhâva | | | | | |
| 4965 | 1786 | 1921 | 1270 | 1038-39 | 1863-64 | 57 Rudhirodgârin | 9 Yuvan | 5 Srâvana | 9744 | 29.232 | 316 | 0.948 |
| 4966 | 1787 | 1922 | 1271 | 1039-40 | *1864-65 | 58 Raktâksha | 10 Dhâtri | | | | | |
| 4967 | 1788 | 1923 | 1272 | 1040-41 | 1865-66 | 59 Krodhana | 11 Îsvara | | | | | |
| 4968 | 1789 | 1924 | 1273 | 1041-42 | 1866-67 | 60 Kshaya | 12 Bahudhânya | 3 Jyeshtha | 9326 | 27.978 | 111 | 0.333 |
| 4969 | 1790 | 1925 | 1274 | 1042-43 | 1867-68 | 1 Prabhava | 13 Pramâthin | | | | | |
| 4970 | 1791 | 1926 | 1275 | 1043-44 | *1868-69 | 2 Vibhava | 14 Vikrama | | | | | |

[1] Vibhava, No. 2, was suppressed in the north.

# TABLE I.

*(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.*

III. COMMENCEMENT OF THE

| Solar year. | | | | | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | Kali. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Day and Month A. D. | (Time of the Mesha saṅkrânti.) | | | | | | | | | Day and Month A. D. | Week day. | At Sunrise on meridian of Ujjain. | | | | | |
| | Week day. | By the Ârya Siddhânta. | | | | By the Sûrya Siddhânta. | | | | | | Moon's Age. | | a. | b. | c. | |
| | | Gh. | Pa. | H. | M. | Gh. | Pa. | H. | M. | | | Lunar parts elapsed. (t) | Tithis elapsed. | | | | |
| 13 | 14 | 15 | | 17 | | 15a | | 17a | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 11 April (101) | 3 Tues.... | 13 | 1 | 5 | 12 | 19 | 8 | 7 | 33 | 6 April (96).. | 5 Thur... | 255 | .765 | 9979 | 212 | 264 | 4939 |
| 11 April (101) | 4 Wed.... | 28 | 32 | 11 | 25 | 34 | 39 | 13 | 52 | 26 Mar. (85).. | 2 Mon.... | 46 | .138 | 9855 | 59 | 233 | 4940 |
| 11 April (101). | 5 Thur... | 44 | 4 | 17 | 37 | 50 | 11 | 20 | 4 | 16 Mar. (75).. | 0 Sat..... | 161 | .483 | 60 | 942 | 205 | 4941 |
| 10 April (101) | 6 Fri..... | 59 | 35 | 23 | 50 | +5 | 42 | +2 | 17 | 8 April (94).. | 6 Fri..... | 147 | .441 | 104 | 878 | 256 | 4942 |
| 11 April (101). | 1 Sun.... | 15 | 6 | 6 | 2 | 21 | 14 | 8 | 29 | 24 Mar. (83).. | 4 Wed.... | 318 | .954 | 318 | 761 | 228 | 4943 |
| 11 April (101) | 2 Mon. .. | 30 | 37 | 12 | 15 | 36 | 45 | 14 | 42 | 11 April (101). | 2 Mon.... | 36 | .108 | 14 | 661 | 277 | 4944 |
| 11 April (101). | 3 Tues. .. | 46 | 9 | 18 | 27 | 52 | 17 | 20 | 55 | 31 Mar. (90).. | 6 Fri..... | 23 | .069 | 9890 | 506 | 246 | 4945 |
| 11 April (102). | 5 Thur... | 1 | 40 | 0 | 40 | 7 | 48 | 3 | 7 | 19 Mar. (79).. | 3 Tues.... | 16 | .048 | 9765 | 350 | 215 | 4946 |
| 11 April (101). | 6 Fri..... | 17 | 11 | 6 | 52 | 23 | 20 | 9 | 20 | 7 April (97).. | 2 Mon .... | 75 | .225 | 9800 | 296 | 266 | 4947 |
| 11 April (101). | 0 Sat..... | 32 | 42 | 13 | 5 | 38 | 51 | 15 | 33 | 28 Mar. (87).. | 0 Sat..... | 279 | .837 | 14 | 175 | 238 | 4948 |
| 11 April (101). | 1 Sun.... | 48 | 14 | 19 | 17 | 54 | 23 | 21 | 45 | 17 Mar. (76).. | 4 Wed.... | 52 | .156 | 9890 | 22 | 208 | 4949 |
| 11 April (102). | 3 Tues.... | 3 | 45 | 1 | 30 | 9 | 54 | 3 | 58 | 4 April (95).. | 3 Tues.... | 28 | .084 | 9925 | 958 | 259 | 4950 |
| 11 April (101). | 4 Wed.... | 19 | 16 | 7 | 42 | 25 | 26 | 10 | 10 | 25 Mar. (84).. | 1 Sun.... | 162 | .486 | 139 | 842 | 231 | 4951 |
| 11 April (101). | 5 Thur... | 34 | 47 | 13 | 55 | 40 | 58 | 16 | 23 | 14 Mar. (73).. | 5 Thur... | 28 | .084 | 15 | 689 | 200 | 4952 |
| 11 April (101). | 6 Fri..... | 50 | 19 | 20 | 7 | 56 | 29 | 22 | 36 | 2 April (92). | 4 Wed.... | 90 | .270 | 49 | 625 | 251 | 4953 |
| 11 April (102). | 1 Sun.... | 5 | 50 | 2 | 20 | 12 | 1 | 4 | 48 | 21 Mar. (81).. | 1 Sun.... | 90 | .270 | 9935 | 472 | 220 | 4954 |
| 11 April (101). | 2 Mon.... | 21 | 21 | 8 | 32 | 27 | 32 | 11 | 1 | 9 April (99).. | 0 Sat..... | 177 | .531 | 9960 | 408 | 272 | 4955 |
| 11 April (101). | 3 Tues.... | 36 | 52 | 14 | 45 | 43 | 4 | 17 | 13 | 29 Mar. (88).. | 4 Wed.... | 115 | .345 | 9835 | 255 | 241 | 4956 |
| 11 April (101). | 4 Wed.... | 52 | 24 | 20 | 57 | 58 | 35 | 23 | 26 | 19 Mar. (78).. | 2 Mon.... | 299 | .897 | 50 | 139 | 213 | 4957 |
| 11 April (102). | 6 Fri..... | 7 | 55 | 3 | 10 | 14 | 7 | 5 | 39 | 6 April (97).. | 1 Sun.... | 288 | .864 | 84 | 75 | 264 | 4958 |
| 11 April (101). | 0 Sat..... | 23 | 26 | 9 | 22 | 29 | 38 | 11 | 51 | 26 Mar. (85).. | 5 Thur... | 34 | .102 | 9960 | 922 | 233 | 4959 |
| 11 April (101). | 1 Sun.... | 38 | 57 | 15 | 35 | 45 | 10 | 18 | 4 | 16 Mar. (75).. | 3 Tues.... | 186 | .558 | 175 | 806 | 205 | 4960 |
| 11 April (101). | 2 Mon.... | 54 | 29 | 21 | 47 | +0 | 41 | +0 | 16 | 4 April (94).. | 2 *Mon.... | 209 | .627 | 209 | 741 | 257 | 4961 |
| 11 April (102). | 4 Wed.... | 10 | 0 | 4 | 0 | 16 | 13 | 6 | 29 | 23 Mar. (83).. | 6 Fri..... | 151 | .453 | 85 | 589 | 226 | 4962 |
| 11 April (101). | 5 Thur... | 25 | 31 | 10 | 12 | 31 | 44 | 12 | 42 | 11 April (101). | 5 Thur... | 239 | .717 | 120 | 525 | 277 | 4963 |
| 11 April (101). | 6 Fri..... | 41 | 2 | 16 | 25 | 47 | 16 | 18 | 54 | 31 Mar. (90).. | 2 Mon.... | 236 | .708 | 9995 | 372 | 246 | 4964 |
| 11 April (101). | 0 Sat..... | 56 | 34 | 22 | 37 | +2 | 47 | +1 | 7 | 20 Mar. (79).. | 6 Fri..... | 149 | .447 | 9871 | 219 | 215 | 4965 |
| 11 April (102). | 2 Mon.... | 12 | 5 | 4 | 50 | 18 | 19 | 7 | 20 | 7 April (98).. | 5 Thur... | 161 | .483 | 9996 | 155 | 267 | 4966 |
| 11 April (101) | 3 Tues.... | 27 | 36 | 11 | 2 | 33 | 50 | 13 | 32 | 28 Mar. (87).. | 3 Tues.... | 294 | .882 | 120 | 39 | 239 | 4967 |
| 11 April (101). | 4 Wed.... | 43 | 7 | 17 | 15 | 49 | 22 | 19 | 45 | 17 Mar. (76).. | 0 Sat..... | 46 | .138 | 9996 | 886 | 208 | 4968 |
| 11 April (101). | 5 Thur... | 58 | 39 | 23 | 27 | +4 | 53 | +1 | 57 | 5 April (95).. | 6 Fri..... | 44 | .132 | 30 | 822 | 259 | 4969 |
| 11 April (102). | 0 Sat..... | 14 | 10 | 5 | 40 | 20 | 25 | 8 | 10 | 25 Mar. (85).. | 4 Wed.... | 250 | .750 | 245 | 705 | 231 | 4970 |

[1] See footnote p. liii above.

# TABLE I.

*Lunation-parts = 10,000ths of a circle. A tithi = 1/30th of the moon's synodic revolution.*

| I. CONCURRENT YEAR. | | | | | | | | II. ADDED LUNAR MONTHS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Samvatsara. | | True. | | | | |
| Kali. | Saka. | Chaitrâdi. Vikrama. | Meshâdi (Solar) year in Bengal. | Kollam. | A. D. | Luni-Solar cycle (Southern.) | Brihaspati cycle (Northern) current at Mesha sankrânti. | Name of month. | Time of the preceding sankrânti expressed in: Lunation parts. (*t*.) | Tithis. | Time of the succeeding sankrânti expressed in: Lunation parts. (*t*.) | Tithis. |
| 1 | 2 | 3 | 3a | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 4971 | 1792 | 1927 | 1276 | 1044-45 | 1869- 70 | 3 Śukla | 15 Vrisha | 2 Vaiśâkha | 9869 | 29.607 | 299 | 0.897 |
| 4972 | 1793 | 1928 | 1277 | 1045-46 | 1870- 71 | 4 Pramoda | 16 Chitrabhânu | | | | | |
| 4973 | 1794 | 1929 | 1278 | 1046-47 | 1871- 72 | 5 Prajâpati | 17 Subhânu | 6 Bhâdrapada | 9796 | 29.388 | 297 | 0.891 |
| 4974 | 1795 | 1930 | 1279 | 1047-48 | *1872- 73 | 6 Aṅgiras | 18 Târana | | | | | |
| 4975 | 1796 | 1931 | 1280 | 1048-49 | 1873- 74 | 7 Śrîmukha | 19 Pârthiva | | | | | |
| 4976 | 1797 | 1932 | 1281 | 1049-50 | 1874- 75 | 8 Bhâva | 20 Vyaya | 4 Âshâḍha | 9648 | 28.944 | 429 | 1.287 |
| 4977 | 1798 | 1933 | 1282 | 1050-51 | 1875- 76 | 9 Yuvan | 21 Sarvajit | | | | | |
| 4978 | 1799 | 1934 | 1283 | 1051-52 | *1876- 77 | 10 Dhâtri | 22 Sarvadhârin | | | | | |
| 4979 | 1800 | 1935 | 1284 | 1052-53 | 1877- 78 | 11 Îśvara | 23 Virodhin | 3 Jyeshṭha | 9802 | 29.406 | 527 | 1.581 |
| 4980 | 1801 | 1936 | 1285 | 1053-54 | 1878- 79 | 12 Bahudhânya | 24 Vikrita | | | | | |
| 4981 | 1802 | 1937 | 1286 | 1054-55 | 1879- 80 | 13 Pramâthin | 25 Khara | 7 Âśvina | 9818 | 29.454 | 194 | 0.582 |
| 4982 | 1803 | 1938 | 1287 | 1055-56 | *1880- 81 | 14 Vikrama | 26 Nandana | | | | | |
| 4983 | 1804 | 1939 | 1288 | 1056-57 | 1881- 82 | 15 Vrisha | 27 Vijaya | | | | | |
| 4984 | 1805 | 1940 | 1289 | 1057-58 | 1882- 83 | 16 Chitrabhânu | 28 Jaya | 5 Śrâvaṇa | 9921 | 29.763 | 510 | 1.530 |
| 4985 | 1806 | 1941 | 1290 | 1058-59 | 1883- 84 | 17 Subhânu | 29 Manmatha | | | | | |
| 4986 | 1807 | 1942 | 1291 | 1059-60 | *1884- 85 | 18 Târana | 30 Durmukha | | | | | |
| 4987 | 1808 | 1943 | 1292 | 1060-61 | 1885- 86 | 19 Pârthiva | 31 Hemalamba | 3 Jyeshṭha | 9328 | 27.984 | 70 | 0.210 |
| 4988 | 1809 | 1944 | 1293 | 1061-62 | 1886- 87 | 20 Vyaya | 32 Vilamba | | | | | |
| 4989 | 1810 | 1945 | 1294 | 1062-63 | 1887- 88 | 21 Sarvajit | 33 Vikârin | | | | | |
| 4990 | 1811 | 1946 | 1295 | 1063-64 | *1888- 89 | 22 Sarvadhârin | 34 Śârvari | 1 Chaitra | 9857 | 29.571 | 62 | 0.186 |
| 4991 | 1812 | 1947 | 1296 | 1064-65 | 1889- 90 | 23 Virodhin | 35 Plava | | | | | |
| 4992 | 1813 | 1948 | 1297 | 1065-66 | 1890- 91 | 24 Vikrita | 36 Śubhakrit | 6 Bhâdrapada | 9973 | 29.919 | 402 | 1.206 |
| 4993 | 1814 | 1949 | 1298 | 1066-67 | 1891- 92 | 25 Khara | 37 Śobhana | | | | | |
| 4994 | 1815 | 1950 | 1299 | 1067-68 | *1892- 93 | 26 Nandana | 38 Krodhin | | | | | |
| 4995 | 1816 | 1951 | 1300 | 1068-69 | 1893- 94 | 27 Vijaya | 39 Viśvâvasu | 4 Âshâḍha | 9616 | 28.848 | 479 | 1.437 |
| 4996 | 1817 | 1952 | 1301 | 1069-70 | 1894- 95 | 28 Jaya | 40 Parâbhava | | | | | |
| 4997 | 1818 | 1953 | 1302 | 1070-71 | 1895- 96 | 29 Manmatha | 41 Plavaṅga | | | | | |
| 4998 | 1819 | 1954 | 1303 | 1071-72 | *1896- 97 | 30 Durmukha | 42 Kîlaka | 3 Jyeshṭha | 9921 | 29.763 | 544 | 1.632 |
| 4999 | 1820 | 1955 | 1304 | 1072-73 | 1897- 98 | 31 Hemalamba | 43 Saumya | | | | | |
| 5000 | 1821 | 1956 | 1305 | 1073-74 | 1898- 99 | 32 Vilamba | 44 Sâdhârana | 7 Âśvina | 9888 | 29.664 | 189 | 0.567 |
| 5001 | 1822 | 1957 | 1306 | 1074-75 | 1899-900 | 33 Vikârin | 45 Virodhakrit | | | | | |
| 5002 | 1823 | 1958 | 1307 | 1075-76 | 1900§- 1 | 34 Śârvari | 46 Paridhâvin | | | | | |

§ The year 1900 A. D. will not be a leap-year.

# TABLE I.

(Col. 23) a = Distance of moon from sun. (Col. 24) b = moon's mean anomaly. (Col. 25) c = sun's mean anomaly.

## III. COMMENCEMENT OF THE

| Solar year. | | | | | | | | | | Luni-Solar year. (Civil day of Chaitra Śukla 1st.) | | | | | | | Kali. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Day and Month A. D. | (Time of the Mesha saṅkrânti.) | | | | | | | | | Day and Month A. D. | Week day | At Sunrise on meridian of Ujjain. | | | | | |
| | Week day. | By the Ârya Siddhânta. | | | | By the Sûrya Siddhânta. | | | | | | Moon's Age | | | | | |
| | | Gh. | Pa. | H. | M. | Gh. | Pa. | H. | M. | | | Lunat. parts elapsed (t.) | Tithis elapsed. | a. | b. | c. | |
| 13 | 14 | 15 | | 17 | | 15a | | 17a | | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 1 |
| 11 April (101). | 1 Sun.... | 29 | 41 | 11 | 52 | 35 | 56 | 14 | 23 | 14 Mar. (73).. | 1 Sun.... | 217 | .651 | 120 | 553 | 200 | 4971 |
| 11 April (101). | 2 Mon.... | 45 | 12 | 18 | 5 | 51 | 28 | 20 | 35 | 2 April (92).. | 0 Sat..... | 306 | .918 | 155 | 486 | 251 | 4972 |
| 12 April (102). | 4 Wed.... | 0 | 44 | 0 | 17 | 7 | 0 | 2 | 48 | 22 Mar. (81).. | 4 Wed.... | 292 | .876 | 31 | 336 | 221 | 4973 |
| 11 April (102). | 5 Thur... | 16 | 15 | 6 | 30 | 22 | 31 | 9 | 0 | 8 April (99).. | 2 Mon.... | 7 | .021 | 9727 | 235 | 269 | 4974 |
| 11 April (101). | 6 Fri..... | 31 | 46 | 12 | 42 | 38 | 3 | 15 | 13 | 29 Mar. (88).. | 0 Sat..... | 176 | .528 | 9941 | 119 | 241 | 4975 |
| 11 April (101). | 0 Sat..... | 47 | 17 | 18 | 55 | 53 | 34 | 21 | 26 | 19 Mar. (78).. | 5 Thur... | 299 | .897 | 155 | 2 | 213 | 4976 |
| 12 April (102). | 2 Mon.... | 2 | 49 | 1 | 7 | 9 | 6 | 3 | 38 | 7 April (97).. | 4 Wed.... | 276 | .828 | 190 | 938 | 264 | 4977 |
| 11 April (102). | 3 Tues... | 18 | 20 | 7 | 20 | 24 | 37 | 9 | 51 | 26 Mar. (86).. | 1 Sun.... | 70 | .210 | 66 | 786 | 233 | 4978 |
| 11 April (101). | 4 Wed.... | 33 | 51 | 13 | 32 | 40 | 9 | 16 | 3 | 16 Mar. (75).. | 6 Fri..... | 300 | .900 | 280 | 669 | 205 | 4979 |
| 11 April (101). | 5 Thur... | 49 | 22 | 19 | 45 | 55 | 40 | 22 | 16 | 3 April (93).. | 4 Wed.... | 57 | .171 | 9976 | 569 | 254 | 4980 |
| 12 April (102). | 0 Sat..... | 4 | 54 | 1 | 57 | 11 | 12 | 4 | 29 | 23 Mar. (82).. | 1 Sun.... | 63 | .189 | 9852 | 416 | 223 | 4981 |
| 11 April (102). | 1 Sun.... | 20 | 25 | 8 | 10 | 26 | 43 | 10 | 41 | 10 April (101). | 0 Sat..... | 139 | .417 | 9887 | 352 | 274 | 4982 |
| 11 April (101). | 2 Mon.... | 35 | 56 | 14 | 22 | 42 | 15 | 16 | 54 | 30 Mar. (89). | 4 Wed.... | 35 | .105 | 9762 | 199 | 244 | 4983 |
| 11 April (101). | 3 Tues... | 51 | 27 | 20 | 35 | 57 | 46 | 23 | 7 | 20 Mar. (79).. | 2 Mon.... | 188 | .564 | 9977 | 83 | 215 | 4984 |
| 12 April (102). | 5 Thur... | 6 | 59 | 2 | 47 | 13 | 18 | 5 | 19 | 8 April (98).. | 1 Sun.... | 168 | .504 | 11 | 19 | 267 | 4985 |
| 11 April (102). | 6 Fri..... | 22 | 30 | 9 | 0 | 28 | 49 | 11 | 32 | 28 Mar. (88). | 6 Fri..... | 285 | .855 | 226 | 902 | 239 | 4986 |
| 11 April (101). | 0 Sat..... | 38 | 1 | 15 | 12 | 44 | 21 | 17 | 44 | 17 Mar. (76).. | 3 Tues... | 103 | .309 | 101 | 749 | 208 | 4987 |
| 11 April (101). | 1 Sun.... | 53 | 32 | 21 | 25 | 59 | 52 | 23 | 57 | 5 April (95).. | 2 Mon.... | 147 | .441 | 130 | 685 | 250 | 4988 |
| 12 April (102). | 3 Tues... | 9 | 4 | 3 | 37 | 15 | 24 | 6 | 9 | 25 Mar. (84).. | 6 Fri..... | 123 | .369 | 12 | 533 | 229 | 4989 |
| 11 April (102). | 4 Wed.... | 24 | 35 | 9 | 50 | 30 | 55 | 12 | 22 | 13 Mar. (73).. | 3 Tues... | 126 | .378 | 9887 | 380 | 199 | 4990 |
| 11 April (101). | 5 Thur... | 40 | 6 | 16 | 2 | 46 | 27 | 18 | 35 | 1 April (91).. | 2 Mon.... | 190 | .570 | 9922 | 316 | 250 | 4991 |
| 11 April (101). | 6 Fri..... | 55 | 37 | 22 | 15 | †1 | 58 | †0 | 47 | 21 Mar. (80).. | 6 Fri..... | 49 | .147 | 9798 | 163 | 219 | 4992 |
| 12 April (102). | 1 Sun.... | 11 | 9 | 4 | 27 | 17 | 30 | 7 | 0 | 9 April (99).. | 5 Thur... | 54 | .162 | 9832 | 99 | 270 | 4993 |
| 11 April (102). | 2 Mon.... | 26 | 40 | 10 | 40 | 33 | 2 | 13 | 12 | 29 Mar. (89).. | 3 Tues... | 171 | .513 | 47 | 982 | 242 | 4994 |
| 11 April (101). | 3 Tues... | 42 | 11 | 16 | 52 | 48 | 33 | 19 | 25 | 19 Mar. (78).. | 1 Sun.... | 299 | .897 | 261 | 866 | 214 | 4995 |
| 11 April (101). | 4 Wed.... | 57 | 42 | 23 | 5 | †4 | 5 | †1 | 38 | 7 April (97).. | 0 Sat..... | 304 | .912 | 296 | 802 | 265 | 4996 |
| 12 April (102). | 6 Fri..... | 13 | 14 | 5 | 17 | 19 | 36 | 7 | 50 | 27 Mar. (86).. | 4 Wed.... | 198 | .594 | 171 | 649 | 235 | 4997 |
| 11 April (102). | 0 Sat..... | 28 | 45 | 11 | 30 | 35 | 8 | 14 | 3 | 15 Mar. (75).. | 1 Sun.... | 194 | .582 | 47 | 496 | 204 | 4998 |
| 11 April (101). | 1 Sun.... | 44 | 16 | 17 | 42 | 50 | 39 | 20 | 16 | 3 April (93).. | 0 Sat..... | 280 | .840 | 82 | 432 | 255 | 4999 |
| 11 April (101). | 2 Mon.... | 59 | 47 | 23 | 55 | †6 | 11 | †2 | 28 | 23 Mar. (82).. | 4 Wed.... | 235 | .705 | 9957 | 280 | 224 | 5000 |
| 12 April (102). | 4 Wed.... | 15 | 19 | 6 | 7 | 21 | 42 | 8 | 41 | 11 April (101). | 3 Tues... | 270 | .810 | 9992 | 216 | 276 | 5001 |
| 12 April (102). | 5 Thur... | 30 | 50 | 12 | 20 | 37 | 14 | 14 | 53 | 31 Mar. (90).. | 0 Sat..... | 62 | .186 | 9868 | 63 | 245 | 5002 |

† See footnote p. liii above.

# TABLE II. PART I.

CORRESPONDENCE OF AMÂNTA AND PÛRṆIMÂNTA MONTHS

*(See Art. 51.)*

| Amânta months. | Fortnights. | Pûrṇimânta months. |
|---|---|---|
| 1 | 2 | 3 |
| 1 Chaitra...... | Śukla........... | Chaitra. |
| | Kṛishṇa........... | Vaiśâkha. |
| 2 Vaiśâkha....... | Śukla........... | |
| | Kṛishṇa........... | Jyeshṭha. |
| 3 Jyeshṭha........ | Śukla........... | |
| | Kṛishṇa........... | Âshâḍha. |
| 4 Âshâḍha........ | Śukla........... | |
| | Kṛishṇa........... | Śrâvaṇa. |
| 5 Śrâvaṇa....... | Śukla........... | |
| | Kṛishṇa........... | Bhâdrapada. |
| 6 Bhâdrapada... | Śukla........... | |
| | Kṛishṇa........... | Âśvina. |
| 7 Âśvina........ | Śukla........... | |
| | Kṛishṇa........... | Kârttika. |
| 8 Kârttika....... | Śukla........... | |
| | Kṛishṇa........... | Mârgaśîrsha. |
| 9 Mârgaśîrsha...... | Śukla........... | |
| | Kṛishṇa........... | Pausha. |
| 10 Pausha....... | Śukla........... | |
| | Kṛishṇa........... | Mâgha. |
| 11 Mâgha......... | Śukla........... | |
| | Kṛishṇa........... | Phâlguna. |
| 12 Phâlguna........ | Śukla........... | |
| | Kṛishṇa........... | Chaitra. |

Śukla = Śuddha and other synonyms.
Kṛishṇa = Bahula, Vadya, and other synonyms.

# TABLE II. PART II.

## CORRESPONDENCE OF MONTHS IN DIFFERENT ERAS.

*(See Art. 103 of the Text.)*

| | LUNI-SOLAR YEAR. | | | | | Other months corresponding to Lunar months. | |
|---|---|---|---|---|---|---|---|
| | Chaitrâdi. | | Âshâḍhâdi. | Âśvinâdi. | Kârttikâdi. | | |
| | Sanskṛit names of months. | Tuḷu names. | Sanskṛit names of months. | | | Solar months. | Months A. D. |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | Kali 4179. Vikrama 1135. | Śaka 1000. Gupta 758. | Vikrama Samvat 1134. | Chedi (Kalachuri) 829. | Vikrama 1134 Nevâr 198. | | A. D. 1077. |
| 1 | Chaitra. | Paggu. | Chaitra. | Chaitra. | Chaitra. | Mîna, Mesha. | Feb., March, April, May. |
| 2 | Vaiśâkha. | Besâ. | Vaiśâkha. | Vaiśâkha. | Vaiśâkha. | Mesha, Vṛishabha. | March, April, May, June. |
| 3 | Jyeshṭha. | Kârtelu. | Jyeshṭha. | Jyeshṭha. | Jyeshṭha. | Vṛishabha, Mithuna. | April, May, June, July. |
| | | | 1135 | | | | |
| 4 | Âshâḍha. | Âṭi. | Âshâḍha. | Âshâḍha. | Âshâḍha. | Mithuna, Karka. | May, June, July, Aug. |
| 5 | Śrâvaṇa. | Sôna. | Śrâvaṇa. | Śrâvaṇa. | Śrâvaṇa. | Karka, Siṃha. | June, July, Aug., Sept. |
| 6 | Bhâdrapada. | Nirnâla. | Bhâdrapada. | Bhâdrapada. | Bhâdrapada. | Siṃha, Kanyâ. | July, Aug., Sept., Oct. |
| | | | | 830. | | | |
| 7 | Âśvina. | Bontelu. | Âśvina. | Âśvina. | Âśvina. | Kanyâ, Tulâ. | Aug., Sept., Oct., Nov. |
| | | | | | 1135; 199. | | |
| 8 | Kârttika. | Jârde. | Kârttika. | Kârttika. | Kârttika. | Tulâ, Vṛiśchika. | Sept., Oct., Nov., Dec. |
| | | | | | | | 1078. |
| 9 | Mârgaśîrsha. | Perârde. | Mârgaśîrsha. | Mârgaśîrsha. | Mârgaśîrsha. | Vṛiśchika, Dhanus. | Oct., Nov., Dec., Jan. |
| 10 | Pausha. | Pûntelu. | Pausha. | Pausha. | Pausha. | Dhanus, Makara. | Nov., Dec., Jan., Feb. |
| 11 | Mâgha. | Mâyi. | Mâgha. | Mâgha. | Mâgha. | Makara, Kumbha. | Dec., Jan., Feb., March. |
| 12 | Phâlguna. | Suggi. | Phâlguna. | Phâlguna. | Phâlguna. | Kumbha, Mîna. | Jan., Feb., March, April. |

N.B. i. All the years are current, and the lunar-months are amânta.

N.B. ii. *Chaitrâdi* = "beginning with Chaitra"; *Meshâdi* = "beginning with Mesha" and so on.

# TABLE II. PART II. (CONTINUED.)

## CORRESPONDENCE OF MONTHS IN DIFFERENT ERAS.

*(See Art. 103 of the Text.)*

| | SOLAR YEAR. | | | | | | | Other months corresponding to Solar months | |
|---|---|---|---|---|---|---|---|---|---|
| | Meshâdi. | | | Simhâdi | | Kanyâdi. | | | |
| | Sign names | Bengali names. | Tamil names. | Tinnevelly names. | South Malayâḷam names. | North Malayâḷam names | Orissa names | Lunar months. | Months A. D. |
| | 8 | 9 | 10 | 11 | 12 | 13 | | 14 | 15 |
| | Kali 4179. Śaka 1000. | Vikrama 1135. Bengali San 484. | | Tinnevelly 252. | Kollam 253. | Kollam 252. | Vilâyati 484 | | A. D. 1077. |
| 1 | Mesha. | Vaiśâkha (Boiśâk). | Chittirai (Śittirai). | Chittirai (Śittirai) | Mêḍam. | Mêḍam. | Boiśâk. | Chait., Vaiś. | Mar., Apr., May. |
| 2 | Vṛishabha | Jyeshṭha (Joishṭho). | Vaigâśi, Vaiyâśi. | Vaigâśi (Vaiyâśi). | Eḍavam. | Eḍavam. | Joistho. | Vaiś., Jyesh. | Apr., May, June. |
| 3 | Mithuna. | Âshâḍha (Âsâr) | Âni. | Âni. | Midunam. | Midunam. | Âsâr. | Jyesh., Âshâ. | May, June, July. |
| 4 | Karka. | Śrâvaṇa (Shrâban) | Âḍi. | Âḍi. | Karkaḍakam | Karkaḍakam. | Sawun. | Âshâ., Śrâv. | June, July, Aug. |
| | | | | 253. | 253. | | | | |
| 5 | Simha. | Bhâdrapada (Bhâdro) | Âvaṇi. | Âvaṇi. | Chiṅgam. | Chiṅgam. | Bhâdro. | Śrâv., Bhâd. | July, Aug., Sept. |
| | | | | | | 253. | 485. | | |
| 6 | Kanyâ. | Âśvina (Âśin) | Puraṭṭâśi —(Puraṭṭâśi). | Puraṭṭâśi —(Puraṭṭâśi) | Kanni. | Kanni. | Âśin. | Bhâd., Âśv. | Aug., Sept., Oct. |
| 7 | Tulâ. | Kârttika (Kârttik). | Aippaśi (Arppiśi, —Appiśi). | Aippaśi (Arppiśi, —Appiśi) | Tulâm. | Tulâm. | Kârttik. | Âśv., Kârtt. | Sept., Oct., Nov. |
| 8 | Vṛiśchika. | Mârgaśîrsha (Âghrân) | Kârttigai. | Kârttigai. | Vṛiśchikam. | Vṛiśchikam. | Âghrân. | Kârt., Mârg. | Oct., Nov., Dec. |
| | | | | | | | | | 1078. |
| 9 | Dhanus | Pausha (Paus) | Mârgaḷi. | Mârgaḷi. | Dhanu. | Dhanu. | Paus. | Mârg., Paus. | Nov., Dec., Jan. |
| 10 | Makara | Mâgha. | Tai. | Tai. | Makaram. | Makaram. | Mâgha | Paus., Mâgh | Dec., Jan., Feb. |
| 11 | Kumbha. | Phâlguna (Falgûn) | Mâśi. | Mâśi. | Kumbham. | Kumbham | Falgûn | Mâgh., Phâl. | Jan., Feb., Mar. |
| 12 | Mîna. | Chaitra (Choitro). | Paṅguni. | Paṅguni | Mînam | Mînam. | Choitro. | Phâl., Chait. | Feb., Mar., Apr. |

# TABLE, PART III.

## CORRESPONDENCE OF DIFFERENT ERAS

N.B. i. The month in which the year of a non-Chaitrâdi non-Meshâdi era begins is given in brackets in the heading. An era which has no month printed under it in the heading is Chaitrâdi or Meshâdi.

N.B. ii. To turn a year of one era into that of another take the year 0 under one and the corresponding year on the same horizontal line under the other. For instance, to turn a Saka into a Vikrama year and vice versâ, Saka 0 = Chaitrâdi Vikrama 135 = Âshâḍhâdi or Kârttikâdi Vikrama 134-5. 0 = either kind of Vikrama 57-8; and so on. (See also Art. 104 of the text.)

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kali. | | | | | | | | | | | | | | | | | | | | | |
| 0 | Saptarshi. | | | | | | | | | | | | | | | | | | | | |
| 26 | 0 | Vikrama. | | | | | | | | | | | | | | | | | | | |
| 3044 | 3018 | 0 | Vikrama (Âshâḍha, Kârttika) | | | | | | | | | | | | | | | | | | |
| 3044-5 | 3018-9 | 0-1 | 0 | A. D. (January). | | | | | | | | | | | | | | | | | |
| 3101-2 | 3075-6 | 57-8 | 57-8 | 0 | Saka. | | | | | | | | | | | | | | | | |
| 3179 | 3153 | 135 | 134-5 | 77-8 | 0 | Chedi (Âśvina) | | | | | | | | | | | | | | | |
| 3349-50 | 3323-4 | 305-6 | 305-6<br>304-5 | 247-8 | 170-1 | 0 | Valabhi (Kârttika) | | | | | | | | | | | | | | |
| 3420-1 | 3394-5 | 376-7 | 376-7<br>376 | 318-9 | 241-2 | 71-2 | 0 | Gupta. | | | | | | | | | | | | | |
| 3421 | 3395 | 377 | 376-7 | 319-20 | 242 | 71-2 | 0-1 | 0 | Fasali of South (June, July) | | | | | | | | | | | | |
| 3692-3 | 3666-7 | 648-9 | 648-9<br>647-8 | 590-1 | 513-4 | 342-3 | 271-2 | 271-2 | 0 | Fasali of N. [illegible] | | | | | | | | | | | |
| 3694-5 | 3668-9 | 650-1 | 650-1<br>649-50 | 592-3 | 515-6 | 344-5 | 273-4 | 273-4 | 2-3 | 0 | Bengali. | | | | | | | | | | |
| 3695 | 3669 | 651 | 650-1 | 593-4 | 516 | 345-6 | 274-5 | 274 | 2-3 | 0-1 | 0 | Sûr-San (June) | | | | | | | | | |
| 3701-2 | 3675-6 | 657-8 | 656-7 | 599-600 | 522-3 | 351-2 | 280-1 | 280-1 | 8-9 | 6-7 | 6-7 | 0 | Harsha. | | | | | | | | |
| 3708 | 3682 | 664 | 663-4 | 606-7 | 529 | 358-9 | 287-8 | 287 | 15-6 | 13-4 | 13 | 6-7 | 0 | Mâgi. | | | | | | | |
| 3740 | 3714 | 696 | 695-6 | 638-9 | 561 | 390-1 | 319-20 | 319 | 47-8 | 45-6 | 45 | 38-9 | 32 | 0 | Kollam (Simha, Kanyâ) | | | | | | |
| 3926-7 | 3900-1 | 882-3 | 882-3<br>881-2 | 824-5 | 747-8 | 576-7 | 505-6 | 505-6 | 234-5 | 231-2,<br>232 | 231-2 | 225-6 | 218-9 | 186-7 | 0 | Nevâr (Kârttika) | | | | | |
| 3980-1 | 3954-5 | 936-7 | 935-6<br>936 | 878-9 | 801-2 | 631-2 | 560 | 559-60 | 288-9 | 286-7 | 285-6 | 279-80 | 272-3 | 240-1 | 54-5 | 0 | Châlukya (initial month doubtful) | | | | |
| 4177-8 | 4151-2 | 1133-4 | 1133-4 | 1075-6 | 998-9 | 828-9 | 757-8 | 756-7 | 485-6 | 483-4 | 482-3 | 476-7 | 469-70 | 437-8 | 251-2 | 197-8 | 0 | Simha (Âshâḍha). | | | |
| 4215-6 | 4189-90 | 1171-2 | 1171<br>1170-1 | 1113-4 | 1036-7 | 865-6 | 794-5 | 794-5 | 522-3<br>523-4 | 520-1 | 520-1 | 514-5<br>513-4 | 507-8 | 475-6 | 288-9 | 234-5 | 37-8 | 0 | Lakshmana Sena (Kârttika) | | |
| 4220-1 | 4194-5 | 1176-7 | 1176-7<br>1176 | 1118-9 | 1041-2 | 871-2 | 800 | 799-800 | 528-9 | 526-7 | 525-6 | 519-20 | 512-3 | 480-1 | 294-5 | 240 | 42-3 | 5-6 | 0 | Ilâhi. | |
| 4656-7 | 4630-1 | 1612-3 | 1612-3 | 1555-6 | 1477-8 | 1307-8 | 1236-7 | 1235-6 | 964-5 | 962-3 | 961-2 | 955-6 | 948-9 | 916-7 | 730-1 | 676-7 | 479-80 | 441-2 | 436-7 | 0 | Râjaśaka (Jyeshṭha) |
| 4775-6 | 4749-50 | 1731-2 | 1730-1 | 1673-4 | 1596-7 | 1425-6 | 1354-5 | 1354-5 | 1082-3 | 1081-2 | 1080-1 | 1075-6 | 1067-8 | 1035-6 | 848-9 | 794-5 | 597-8 | 559-60 | 554-5 | 118-9 | 0 |

# TABLE III.

## COLLECTIVE DURATION OF MONTHS.

| Part I. Luni-Solar year (Chaitrâdi). | | | | Part II. Solar year (Meshâdi). | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Serial number. | Name of Month. | Collective duration from the beginning of the year to the end of each month. Exactly in tithis. | Approximately in solar-days. | Serial number. | Name of Month | Saṅkrânti at end of month in col. 5. | Collective duration (in days) from the beginning of the year to the end of the month in col. 5, or to the saṅkrânti in col. 5 a. Exact. By the Ârya Siddhânta. Hindu reckoning. | | | By the Ârya Siddhânta. European reckoning. | | | By the Sûrya Siddhânta. Hindu reckoning. | | | By the Sûrya Siddhânta. European reckoning. | | | Approximate. |
| | | | | | | | D. | GH | P. | D. | H. | M. | D. | GH | P | D | H. | M. | |
| 1 | 2 | 3 | 3a | 4 | 5 | 5a | 6 | | | 7 | | | 8 | | | 9 | | | 10 |
| 1 | Chaitra.... | 30 | 30 | 1 | Mesha.. | Vrishabha.. | 30(2)* | 55 | 30 | 30(2) | 22 | 12 | 30(2) | 56 | 7 | 30(2) | 22 | 27 | 31 |
| 2 | Vaiśâkha... | 60 | 59 | 2 | Vrishabha.. | Mithuna... | 62(6) | 10 | 34 | 62(6) | 7 | 49 | 62(6) | 21 | 29 | 62(6) | 8 | 32 | 62 |
| 3 | Jyeshṭha... | 90 | 89 | 3 | Mithuna. | Karka.... | 93(2) | 56 | 0 | 93(2) | 22 | 24 | 94(3) | 0 | 1 | 94(3) | 0 | 0 | 94 |
| 4 | Âshâḍha... | 120 | 118 | 4 | Karka.... | Siṁha..... | 125(6) | 24 | 4 | 125(6) | 9 | 38 | 125(6) | 25 | 32 | 125(6) | 11 | 25 | 125 |
| 5 | Śrâvaṇa.... | 150 | 148 | 5 | Siṁha.... | Kanyâ..... | 156(2) | 26 | 9 | 156(2) | 10 | 28 | 156(2) | 29 | 39 | 156(2) | 11 | 52 | 156 |
| 6 | Bhâdrapada. | 180 | 177 | 6 | Kanyâ... | Tulâ...... | 186(4) | 53 | 33 | 186(4) | 21 | 25 | 186(4) | 56 | 8 | 186(4) | 22 | 27 | 187 |
| 7 | Âśvina..... | 210 | 207 | 7 | Tulâ.... | Vṛiśchika... | 216(6) | 47 | 43 | 216(6) | 19 | 6 | 216(6) | 49 | 44 | 216(6) | 19 | 54 | 217 |
| 8 | Kârttika.... | 240 | 236 | 8 | Vṛiśchika.. | Dhanus.... | 246(1) | 18 | 16 | 246(1) | 7 | 18 | 246(1) | 19 | 9 | 246(1) | 7 | 40 | 246 |
| 9 | Mârgaśîrsha | 270 | 266 | 9 | Dhanus... | Makara.... | 275(2) | 39 | 18 | 275(2) | 15 | 43 | 275(2) | 38 | 13 | 275(2) | 15 | 17 | 276 |
| 10 | Pausha.... | 300 | 295 | 10 | Makara... | Kumbha... | 305(4) | 6 | 42 | 305(4) | 2 | 41 | 305(4) | 5 | 6 | 305(4) | 2 | 2 | 305 |
| 11 | Mâgha..... | 330 | 325 | 11 | Kumbha... | Mîna...... | 334(5) | 55 | 12 | 334(5) | 22 | 5 | 334(5) | 54 | 19 | 334(5) | 21 | 44 | 335 |
| 12 | Phâlguna.. In intercalary years. | 360 390 | 354 384 | 12 | Mîna.... | Mesha (of the following year)†. | 365(1) | 15 | 31 | 365(1) | 6 | 12 | 365(1) | 15 | 32 | 365(1) | 6 | 13 | 365 |

* The figures in brackets in columns 6, 7, 8, 9 give the (w) or weekday index.

† The moment of the Mesha saṅkrânti coincides with the exact beginning of the solar year.

# TABLE IV.

**(W) (A) (B) (C) FOR EVERY DAY IN THE YEAR.**

*(Prof. Jacobi's Table 7 in Ind. Ant., Vol. XVII., modified and corrected).*

| No. of days. | (w.) | (a.) | (b.) | (c.) | No. of days. | (w.) | (a.) | (b.) | (c.) | No. of days. | (w.) | (a.) | (b.) | (c.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 339 | 36 | 3 | 43 | 1 | 4561 | 561 | 118 | 85 | 1 | 8784 | 85 | 233 |
| 2 | 2 | 677 | 73 | 5 | 44 | 2 | 4900 | 597 | 120 | 86 | 2 | 9122 | 121 | 235 |
| 3 | 3 | 1016 | 109 | 8 | 45 | 3 | 5238 | 633 | 123 | 87 | 3 | 9461 | 157 | 238 |
| 4 | 4 | 1355 | 145 | 11 | 46 | 4 | 5577 | 669 | 126 | 88 | 4 | 9800 | 194 | 241 |
| 5 | 5 | 1693 | 181 | 14 | 47 | 5 | 5916 | 706 | 129 | 89 | 5 | 138 | 230 | 244 |
| 6 | 6 | 2032 | 218 | 16 | 48 | 6 | 6254 | 742 | 131 | 90 | 6 | 477 | 266 | 246 |
| 7 | 0 | 2370 | 254 | 19 | 49 | 0 | 6593 | 778 | 134 | 91 | 0 | 816 | 303 | 249 |
| 8 | 1 | 2709 | 290 | 22 | 50 | 1 | 6932 | 815 | 137 | 92 | 1 | 1154 | 339 | 252 |
| 9 | 2 | 3048 | 327 | 25 | 51 | 2 | 7270 | 851 | 140 | 93 | 2 | 1493 | 375 | 255 |
| 10 | 3 | 3386 | 363 | 27 | 52 | 3 | 7609 | 887 | 142 | 94 | 3 | 1831 | 411 | 257 |
| 11 | 4 | 3725 | 399 | 30 | 53 | 4 | 7947 | 923 | 145 | 95 | 4 | 2170 | 448 | 260 |
| 12 | 5 | 4064 | 435 | 33 | 54 | 5 | 8286 | 960 | 148 | 96 | 5 | 2509 | 484 | 263 |
| 13 | 6 | 4402 | 472 | 36 | 55 | 6 | 8625 | 996 | 151 | 97 | 6 | 2847 | 520 | 266 |
| 14 | 0 | 4741 | 508 | 38 | 56 | 0 | 8963 | 32 | 153 | 98 | 0 | 3186 | 557 | 268 |
| 15 | 1 | 5079 | 544 | 41 | 57 | 1 | 9302 | 69 | 156 | 99 | 1 | 3525 | 593 | 271 |
| 16 | 2 | 5418 | 581 | 44 | 58 | 2 | 9641 | 105 | 159 | 100 | 2 | 3863 | 629 | 274 |
| 17 | 3 | 5757 | 617 | 47 | 59 | 3 | 9979 | 141 | 162 | 101 | 3 | 4202 | 665 | 277 |
| 18 | 4 | 6095 | 653 | 49 | 60 | 4 | 318 | 177 | 164 | 102 | 4 | 4540 | 702 | 279 |
| 19 | 5 | 6434 | 690 | 52 | 61 | 5 | 657 | 214 | 167 | 103 | 5 | 4879 | 738 | 282 |
| 20 | 6 | 6773 | 726 | 55 | 62 | 6 | 995 | 250 | 170 | 104 | 6 | 5218 | 774 | 285 |
| 21 | 0 | 7111 | 762 | 57 | 63 | 0 | 1334 | 286 | 172 | 105 | 0 | 5556 | 811 | 287 |
| 22 | 1 | 7450 | 798 | 60 | 64 | 1 | 1672 | 323 | 175 | 106 | 1 | 5895 | 847 | 290 |
| 23 | 2 | 7789 | 835 | 63 | 65 | 2 | 2011 | 359 | 178 | 107 | 2 | 6234 | 883 | 293 |
| 24 | 3 | 8127 | 871 | 66 | 66 | 3 | 2350 | 395 | 181 | 108 | 3 | 6572 | 919 | 296 |
| 25 | 4 | 8466 | 907 | 68 | 67 | 4 | 2688 | 432 | 183 | 109 | 4 | 6911 | 956 | 298 |
| 26 | 5 | 8804 | 944 | 71 | 68 | 5 | 3027 | 468 | 186 | 110 | 5 | 7250 | 992 | 301 |
| 27 | 6 | 9143 | 980 | 74 | 69 | 6 | 3366 | 504 | 189 | 111 | 6 | 7588 | 28 | 304 |
| 28 | 0 | 9482 | 16 | 77 | 70 | 0 | 3704 | 540 | 192 | 112 | 0 | 7927 | 65 | 307 |
| 29 | 1 | 9820 | 52 | 79 | 71 | 1 | 4043 | 577 | 194 | 113 | 1 | 8265 | 101 | 309 |
| 30 | 2 | 159 | 89 | 82 | 72 | 2 | 4381 | 613 | 197 | 114 | 2 | 8604 | 137 | 312 |
| 31 | 3 | 498 | 125 | 85 | 73 | 3 | 4720 | 649 | 200 | 115 | 3 | 8943 | 174 | 315 |
| 32 | 4 | 836 | 161 | 88 | 74 | 4 | 5059 | 686 | 203 | 116 | 4 | 9281 | 210 | 318 |
| 33 | 5 | 1175 | 198 | 90 | 75 | 5 | 5397 | 722 | 205 | 117 | 5 | 9620 | 246 | 320 |
| 34 | 6 | 1514 | 234 | 93 | 76 | 6 | 5736 | 758 | 208 | 118 | 6 | 9959 | 282 | 323 |
| 35 | 0 | 1852 | 270 | 96 | 77 | 0 | 6075 | 794 | 211 | 119 | 0 | 297 | 319 | 326 |
| 36 | 1 | 2191 | 306 | 99 | 78 | 1 | 6413 | 831 | 214 | 120 | 1 | 636 | 355 | 329 |
| 37 | 2 | 2529 | 343 | 101 | 79 | 2 | 6752 | 867 | 216 | 121 | 2 | 974 | 391 | 331 |
| 38 | 3 | 2868 | 379 | 104 | 80 | 3 | 7091 | 903 | 219 | 122 | 3 | 1313 | 428 | 334 |
| 39 | 4 | 3207 | 415 | 107 | 81 | 4 | 7429 | 940 | 222 | 123 | 4 | 1652 | 464 | 337 |
| 40 | 5 | 3545 | 452 | 110 | 82 | 5 | 7768 | 976 | 224 | 124 | 5 | 1990 | 500 | 339 |
| 41 | 6 | 3884 | 488 | 112 | 83 | 6 | 8106 | 12 | 227 | 125 | 6 | 2329 | 536 | 342 |
| 42 | 0 | 4223 | 524 | 115 | 84 | 0 | 8445 | 48 | 230 | 126 | 0 | 2668 | 573 | 345 |

# TABLE IV. (CONTINUED).

| No. of days. | (w.) | (a.) | (b.) | (c.) | No. of days. | (w.) | (a.) | (b.) | (c.) | No. of days. | (w.) | (a.) | (b.) | (c.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 127 | 1 | 3006 | 609 | 348 | 171 | 3 | 7906 | 206 | 468 | 215 | 5 | 2806 | 803 | 589 |
| 128 | 2 | 3345 | 645 | 350 | 172 | 4 | 8245 | 242 | 471 | 216 | 6 | 3144 | 839 | 591 |
| 129 | 3 | 3684 | 682 | 353 | 173 | 5 | 8583 | 278 | 474 | 217 | 0 | 3483 | 875 | 594 |
| 130 | 4 | 4022 | 718 | 356 | 174 | 6 | 8922 | 315 | 476 | 218 | 1 | 3822 | 912 | 597 |
| 131 | 5 | 4361 | 754 | 359 | 175 | 0 | 9261 | 351 | 479 | 219 | 2 | 4160 | 948 | 600 |
| 132 | 6 | 4699 | 790 | 361 | 176 | 1 | 9599 | 387 | 482 | 220 | 3 | 4499 | 984 | 602 |
| 133 | 0 | 5038 | 827 | 364 | 177 | 2 | 9938 | 424 | 485 | 221 | 4 | 4838 | 20 | 605 |
| 134 | 1 | 5377 | 863 | 367 | 178 | 3 | 276 | 460 | 487 | 222 | 5 | 5176 | 57 | 608 |
| 135 | 2 | 5715 | 899 | 370 | 179 | 4 | 615 | 496 | 490 | 223 | 6 | 5515 | 93 | 611 |
| 136 | 3 | 6054 | 936 | 372 | 180 | 5 | 954 | 532 | 493 | 224 | 0 | 5854 | 129 | 613 |
| 137 | 4 | 6393 | 972 | 375 | 181 | 6 | 1292 | 569 | 496 | 225 | 1 | 6192 | 166 | 616 |
| 138 | 5 | 6731 | 8 | 378 | 182 | 0 | 1631 | 605 | 498 | 226 | 2 | 6531 | 202 | 619 |
| 139 | 6 | 7070 | 45 | 381 | 183 | 1 | 1970 | 641 | 501 | 227 | 3 | 6869 | 238 | 621 |
| 140 | 0 | 7408 | 81 | 383 | 184 | 2 | 2308 | 678 | 504 | 228 | 4 | 7208 | 274 | 624 |
| 141 | 1 | 7747 | 117 | 386 | 185 | 3 | 2647 | 714 | 506 | 229 | 5 | 7547 | 311 | 627 |
| 142 | 2 | 8086 | 153 | 389 | 186 | 4 | 2986 | 750 | 509 | 230 | 6 | 7885 | 347 | 630 |
| 143 | 3 | 8424 | 190 | 392 | 187 | 5 | 3324 | 787 | 512 | 231 | 0 | 8224 | 383 | 632 |
| 144 | 4 | 8763 | 226 | 394 | 188 | 6 | 3663 | 823 | 515 | 232 | 1 | 8563 | 420 | 635 |
| 145 | 5 | 9102 | 262 | 397 | 189 | 0 | 4001 | 859 | 517 | 233 | 2 | 8901 | 456 | 638 |
| 146 | 6 | 9440 | 299 | 400 | 190 | 1 | 4340 | 895 | 520 | 234 | 3 | 9240 | 492 | 641 |
| 147 | 0 | 9779 | 335 | 402 | 191 | 2 | 4679 | 932 | 523 | 235 | 4 | 9579 | 529 | 643 |
| 148 | 1 | 118 | 371 | 405 | 192 | 3 | 5017 | 968 | 526 | 236 | 5 | 9917 | 565 | 646 |
| 149 | 2 | 456 | 407 | 408 | 193 | 4 | 5356 | 4 | 528 | 237 | 6 | 256 | 601 | 649 |
| 150 | 3 | 795 | 444 | 411 | 194 | 5 | 5695 | 41 | 531 | 238 | 0 | 594 | 637 | 652 |
| 151 | 4 | 1133 | 480 | 413 | 195 | 6 | 6033 | 77 | 534 | 239 | 1 | 933 | 674 | 654 |
| 152 | 5 | 1472 | 516 | 416 | 196 | 0 | 6372 | 113 | 537 | 240 | 2 | 1272 | 710 | 657 |
| 153 | 6 | 1811 | 553 | 419 | 197 | 1 | 6710 | 149 | 539 | 241 | 3 | 1610 | 746 | 660 |
| 154 | 0 | 2149 | 589 | 422 | 198 | 2 | 7049 | 186 | 542 | 242 | 4 | 1949 | 783 | 663 |
| 155 | 1 | 2488 | 625 | 424 | 199 | 3 | 7388 | 222 | 545 | 243 | 5 | 2288 | 819 | 665 |
| 156 | 2 | 2827 | 661 | 427 | 200 | 4 | 7726 | 258 | 548 | 244 | 6 | 2626 | 855 | 668 |
| 157 | 3 | 3165 | 698 | 430 | 201 | 5 | 8065 | 295 | 550 | 245 | 0 | 2965 | 891 | 671 |
| 158 | 4 | 3504 | 734 | 433 | 202 | 6 | 8404 | 331 | 553 | 246 | 1 | 3303 | 928 | 673 |
| 159 | 5 | 3842 | 770 | 435 | 203 | 0 | 8742 | 367 | 556 | 247 | 2 | 3642 | 964 | 676 |
| 160 | 6 | 4181 | 807 | 438 | 204 | 1 | 9081 | 403 | 559 | 248 | 3 | 3981 | 0 | 679 |
| 161 | 0 | 4520 | 843 | 441 | 205 | 2 | 9420 | 440 | 561 | 249 | 4 | 4319 | 37 | 682 |
| 162 | 1 | 4858 | 879 | 444 | 206 | 3 | 9758 | 476 | 564 | 250 | 5 | 4658 | 73 | 684 |
| 163 | 2 | 5197 | 916 | 446 | 207 | 4 | 97 | 512 | 567 | 251 | 6 | 4997 | 109 | 687 |
| 164 | 3 | 5536 | 952 | 449 | 208 | 5 | 435 | 549 | 569 | 252 | 0 | 5335 | 146 | 690 |
| 165 | 4 | 5874 | 988 | 452 | 209 | 6 | 774 | 585 | 572 | 253 | 1 | 5674 | 182 | 693 |
| 166 | 5 | 6213 | 24 | 454 | 210 | 0 | 1113 | 621 | 575 | 254 | 2 | 6013 | 218 | 695 |
| 167 | 6 | 6552 | 61 | 457 | 211 | 1 | 1451 | 658 | 578 | 255 | 3 | 6351 | 254 | 698 |
| 168 | 0 | 6890 | 97 | 460 | 212 | 2 | 1790 | 694 | 580 | 256 | 4 | 6690 | 291 | 701 |
| 169 | 1 | 7229 | 133 | 463 | 213 | 3 | 2129 | 730 | 583 | 257 | 5 | 7028 | 327 | 704 |
| 170 | 2 | 7567 | 170 | 465 | 214 | 4 | 2467 | 766 | 586 | 258 | 6 | 7367 | 363 | 706 |

## TABLE IV. (CONTINUED.)

| No. of days. | (w.) | (a.) | (b.) | (c.) | No. of days | (w.) | (a.) | (b.) | (c.) | No. of days | (w.) | (a.) | (b.) | (c.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 259 | 0 | 7706 | 400 | 709 | 302 | 1 | 2267 | 960 | 827 | 344 | 1 | 6489 | 484 | 942 |
| 260 | 1 | 8044 | 436 | 712 | 303 | 2 | 2605 | 996 | 830 | 345 | 2 | 6828 | 521 | 945 |
| 261 | 2 | 8383 | 472 | 715 | 304 | 3 | 2944 | 33 | 832 | 346 | 3 | 7167 | 557 | 947 |
| 262 | 3 | 8722 | 508 | 717 | 305 | 4 | 3283 | 69 | 835 | 347 | 4 | 7505 | 593 | 950 |
| 263 | 4 | 9060 | 545 | 720 | 306 | 5 | 3621 | 105 | 838 | 348 | 5 | 7844 | 629 | 953 |
| 264 | 5 | 9399 | 581 | 723 | 307 | 6 | 3960 | 142 | 840 | 349 | 6 | 8183 | 666 | 955 |
| 265 | 6 | 9737 | 617 | 726 | 308 | 0 | 4299 | 178 | 843 | 350 | 0 | 8521 | 702 | 958 |
| 266 | 0 | 76 | 654 | 728 | 309 | 1 | 4637 | 214 | 846 | 351 | 1 | 8860 | 738 | 961 |
| 267 | 1 | 415 | 690 | 731 | 310 | 2 | 4976 | 250 | 849 | 352 | 2 | 9198 | 775 | 964 |
| 268 | 2 | 753 | 726 | 734 | 311 | 3 | 5315 | 287 | 851 | 353 | 3 | 9537 | 811 | 966 |
| 269 | 3 | 1092 | 762 | 736 | 312 | 4 | 5653 | 323 | 854 | 354 | 4 | 9876 | 847 | 969 |
| 270 | 4 | 1431 | 799 | 739 | 313 | 5 | 5992 | 359 | 857 | 355 | 5 | 214 | 884 | 972 |
| 271 | 5 | 1769 | 835 | 742 | 314 | 6 | 6330 | 396 | 860 | 356 | 6 | 553 | 920 | 975 |
| 272 | 6 | 2108 | 871 | 745 | 315 | 0 | 6669 | 432 | 862 | 357 | 0 | 892 | 956 | 977 |
| 273 | 0 | 2447 | 908 | 747 | 316 | 1 | 7008 | 468 | 865 | 358 | 1 | 1230 | 992 | 980 |
| 274 | 1 | 2785 | 944 | 750 | 317 | 2 | 7346 | 504 | 868 | 359 | 2 | 1569 | 29 | 983 |
| 275 | 2 | 3124 | 980 | 753 | 318 | 3 | 7685 | 541 | 871 | 360 | 3 | 1907 | 65 | 986 |
| 276 | 3 | 3462 | 16 | 756 | 319 | 4 | 8024 | 577 | 873 | 361 | 4 | 2246 | 101 | 988 |
| 277 | 4 | 3801 | 53 | 758 | 320 | 5 | 8362 | 613 | 876 | 362 | 5 | 2585 | 138 | 991 |
| 278 | 5 | 4140 | 89 | 761 | 321 | 6 | 8701 | 650 | 879 | 363 | 6 | 2923 | 174 | 994 |
| 279 | 6 | 4478 | 125 | 764 | 322 | 0 | 9039 | 686 | 882 | 364 | 0 | 3262 | 210 | 997 |
| 280 | 0 | 4817 | 162 | 767 | 323 | 1 | 9378 | 722 | 884 | 365 | 1 | 3601 | 246 | 999 |
| 281 | 1 | 5156 | 198 | 769 | 324 | 2 | 9717 | 758 | 887 | 366 | 2 | 3939 | 283 | 2 |
| 282 | 2 | 5494 | 234 | 772 | 325 | 3 | 56 | 795 | 890 | 367 | 3 | 4278 | 319 | 5 |
| 283 | 3 | 5833 | 271 | 775 | 326 | 4 | 394 | 831 | 893 | 368 | 4 | 4617 | 355 | 8 |
| 284 | 4 | 6171 | 307 | 778 | 327 | 5 | 733 | 867 | 895 | 369 | 5 | 4955 | 392 | 10 |
| 285 | 5 | 6510 | 343 | 780 | 328 | 6 | 1071 | 904 | 898 | 370 | 6 | 5294 | 428 | 13 |
| 286 | 6 | 6849 | 379 | 783 | 329 | 0 | 1410 | 940 | 901 | 371 | 0 | 5632 | 464 | 16 |
| 287 | 0 | 7187 | 416 | 786 | 330 | 1 | 1749 | 976 | 903 | 372 | 1 | 5971 | 500 | 18 |
| 288 | 1 | 7526 | 452 | 788 | 331 | 2 | 2087 | 13 | 906 | 373 | 2 | 6310 | 537 | 21 |
| 289 | 2 | 7865 | 488 | 791 | 332 | 3 | 2426 | 49 | 909 | 374 | 3 | 6648 | 573 | 24 |
| 290 | 3 | 8203 | 525 | 794 | 333 | 4 | 2764 | 85 | 912 | 375 | 4 | 6987 | 609 | 27 |
| 291 | 4 | 8542 | 561 | 797 | 334 | 5 | 3103 | 121 | 914 | 376 | 5 | 7326 | 646 | 29 |
| 292 | 5 | 8881 | 597 | 799 | 335 | 6 | 3442 | 158 | 917 | 377 | 6 | 7664 | 682 | 32 |
| 293 | 6 | 9219 | 633 | 802 | 336 | 0 | 3780 | 194 | 920 | 378 | 0 | 8003 | 718 | 35 |
| 294 | 0 | 9558 | 670 | 805 | 337 | 1 | 4119 | 230 | 923 | 379 | 1 | 8342 | 755 | 38 |
| 295 | 1 | 9896 | 706 | 808 | 338 | 2 | 4458 | 267 | 925 | 380 | 2 | 8680 | 791 | 40 |
| 296 | 2 | 235 | 742 | 810 | 339 | 3 | 4796 | 303 | 928 | 381 | 3 | 9019 | 827 | 43 |
| 297 | 3 | 574 | 779 | 813 | 340 | 4 | 5135 | 339 | 931 | 382 | 4 | 9357 | 863 | 46 |
| 298 | 4 | 912 | 815 | 816 | 341 | 5 | 5473 | 375 | 934 | 383 | 5 | 9696 | 900 | 49 |
| 299 | 5 | 1251 | 851 | 819 | 342 | 6 | 5812 | 412 | 936 | 384 | 6 | 35 | 936 | 51 |
| 300 | 6 | 1590 | 887 | 821 | 343 | 0 | 6151 | 448 | 939 | 385 | 0 | 373 | 972 | 54 |
| 301 | 0 | 1928 | 924 | 824 | | | | | | | | | | |

# TABLE V.

## (A) (B) (C) FOR HOURS AND MINUTES.

(*Prof. Jacobi's Ind. Ant., Table 8*).

| Hours | (a.) | (b.) | (c.) | Minutes. | (a.) | (b.) | (c.) | Minutes. | (a.) | (b.) | (c.) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 14 | 2 | 0 | 1 | 0 | 0 | 0 | 31 | 7 | 1 | 0 |
| 2 | 28 | 3 | 0 | 2 | 0 | 0 | 0 | 32 | 8 | 1 | 0 |
| 3 | 42 | 5 | 0 | 3 | 1 | 0 | 0 | 33 | 8 | 1 | 0 |
| 4 | 56 | 6 | 0 | 4 | 1 | 0 | 0 | 34 | 8 | 1 | 0 |
| 5 | 71 | 8 | 1 | 5 | 1 | 0 | 0 | 35 | 8 | 1 | 0 |
| 6 | 85 | 9 | 1 | 6 | 1 | 0 | 0 | 36 | 8 | 1 | 0 |
| 7 | 99 | 11 | 1 | 7 | 2 | 0 | 0 | 37 | 9 | 1 | 0 |
| 8 | 113 | 12 | 1 | 8 | 2 | 0 | 0 | 38 | 9 | 1 | 0 |
| 9 | 127 | 14 | 1 | 9 | 2 | 0 | 0 | 39 | 9 | 1 | 0 |
| 10 | 141 | 15 | 1 | 10 | 2 | 0 | 0 | 40 | 9 | 1 | 0 |
| 11 | 155 | 17 | 1 | 11 | 3 | 0 | 0 | 41 | 10 | 1 | 0 |
| 12 | 169 | 18 | 1 | 12 | 3 | 0 | 0 | 42 | 10 | 1 | 0 |
| 13 | 183 | 20 | 1 | 13 | 3 | 0 | 0 | 43 | 10 | 1 | 0 |
| 14 | 198 | 21 | 2 | 14 | 3 | 0 | 0 | 44 | 10 | 1 | 0 |
| 15 | 212 | 23 | 2 | 15 | 4 | 0 | 0 | 45 | 11 | 1 | 0 |
| 16 | 226 | 24 | 2 | 16 | 4 | 0 | 0 | 46 | 11 | 1 | 0 |
| 17 | 240 | 26 | 2 | 17 | 4 | 0 | 0 | 47 | 11 | 1 | 0 |
| 18 | 254 | 27 | 2 | 18 | 4 | 0 | 0 | 48 | 11 | 1 | 0 |
| 19 | 268 | 29 | 2 | 19 | 4 | 0 | 0 | 49 | 12 | 1 | 0 |
| 20 | 282 | 30 | 2 | 20 | 5 | 1 | 0 | 50 | 12 | 1 | 0 |
| 21 | 296 | 32 | 2 | 21 | 5 | 1 | 0 | 51 | 12 | 1 | 0 |
| 22 | 310 | 33 | 3 | 22 | 5 | 1 | 0 | 52 | 12 | 1 | 0 |
| 23 | 325 | 35 | 3 | 23 | 5 | 1 | 0 | 53 | 12 | 1 | 0 |
| 24 | 339 | 36 | 3 | 24 | 6 | 1 | 0 | 54 | 13 | 1 | 0 |
| — | — | — | — | 25 | 6 | 1 | 0 | 55 | 13 | 1 | 0 |
| — | — | — | — | 26 | 6 | 1 | 0 | 56 | 13 | 1 | 0 |
| — | — | — | — | 27 | 6 | 1 | 0 | 57 | 13 | 1 | 0 |
| — | — | — | — | 28 | 7 | 1 | 0 | 58 | 14 | 1 | 0 |
| — | — | — | — | 29 | 7 | 1 | 0 | 59 | 14 | 1 | 0 |
| — | — | — | — | 30 | 7 | 1 | 0 | 60 | 14 | 2 | 0 |

# TABLE VI.

## LUNAR EQUATION.

(*Arts.* 107,108).

ARGUMENT (*b*).

N.B. The equation in col. 2 corresponds to either of the arguments in cols. 1 and 3.

*(This is Prof. Jacobi's Ind. Ant., Vol. XVII., Table 9, re-arranged.)*

| Argu. | Equ. | Argu. |
|---|---|---|
| 1 | 2 | 3 |
| 0 | 140 | 500 |
| 10 | 149 | 490 |
| 20 | 158 | 480 |
| 30 | 166 | 470 |
| 40 | 175 | 460 |
| 50 | 184 | 450 |
| 60 | 192 | 440 |
| 70 | 200 | 430 |
| 80 | 208 | 420 |
| 90 | 215 | 410 |
| 100 | 223 | 400 |
| 110 | 230 | 390 |
| 120 | 236 | 380 |
| 130 | 242 | 370 |
| 140 | 248 | 360 |
| 150 | 253 | 350 |
| 160 | 258 | 340 |
| 170 | 263 | 330 |
| 180 | 267 | 320 |
| 190 | 270 | 310 |
| 200 | 273 | 300 |
| 210 | 276 | 290 |
| 220 | 277 | 280 |
| 230 | 279 | 270 |
| 240 | 280 | 260 |
| 250 | 280 | 250 |

| Argu. | Equ. | Argu. |
|---|---|---|
| 1 | 2 | 3 |
| 500 | 140 | 1000 |
| 510 | 131 | 990 |
| 520 | 122 | 980 |
| 530 | 114 | 970 |
| 540 | 105 | 960 |
| 550 | 96 | 950 |
| 560 | 88 | 940 |
| 570 | 80 | 930 |
| 580 | 72 | 920 |
| 590 | 65 | 910 |
| 600 | 57 | 900 |
| 610 | 50 | 890 |
| 620 | 44 | 880 |
| 630 | 38 | 870 |
| 640 | 32 | 860 |
| 650 | 27 | 850 |
| 660 | 22 | 840 |
| 670 | 17 | 830 |
| 680 | 13 | 820 |
| 690 | 10 | 810 |
| 700 | 7 | 800 |
| 710 | 4 | 790 |
| 720 | 3 | 780 |
| 730 | 1 | 770 |
| 740 | 0 | 760 |
| 750 | 0 | 750 |

# TABLE VII.

## SOLAR EQUATION.

(*Arts.* 107,108).

ARGUMENT (*c*).

N.B. The equation in col. 2 corresponds to either of the arguments in cols. 1 and 3.

*(This is Prof. Jacobi's Ind. Ant., Vol. XVII., Table 10, re-arranged.)*

| Argu. | Equ. | Argu. |
|---|---|---|
| 1 | 2 | 3 |
| 0 | 60 | 500 |
| 10 | 57 | 490 |
| 20 | 53 | 480 |
| 30 | 49 | 470 |
| 40 | 45 | 460 |
| 50 | 41 | 450 |
| 60 | 38 | 440 |
| 70 | 34 | 430 |
| 80 | 31 | 420 |
| 90 | 28 | 410 |
| 100 | 25 | 400 |
| 110 | 22 | 390 |
| 120 | 19 | 380 |
| 130 | 16 | 370 |
| 140 | 14 | 360 |
| 150 | 11 | 350 |
| 160 | 9 | 340 |
| 170 | 7 | 330 |
| 180 | 6 | 320 |
| 190 | 4 | 310 |
| 200 | 3 | 300 |
| 210 | 2 | 290 |
| 220 | 1 | 280 |
| 230 | 0 | 270 |
| 240 | 0 | 260 |
| 250 | 0 | 250 |

| Argu. | Equ. | Argu. |
|---|---|---|
| 1 | 2 | 3 |
| 500 | 60 | 1000 |
| 510 | 64 | 990 |
| 520 | 68 | 980 |
| 530 | 72 | 970 |
| 540 | 76 | 960 |
| 550 | 79 | 950 |
| 560 | 83 | 940 |
| 570 | 86 | 930 |
| 580 | 90 | 920 |
| 590 | 93 | 910 |
| 600 | 96 | 900 |
| 610 | 99 | 890 |
| 620 | 102 | 880 |
| 630 | 105 | 870 |
| 640 | 107 | 860 |
| 650 | 109 | 850 |
| 660 | 112 | 840 |
| 670 | 113 | 830 |
| 680 | 115 | 820 |
| 690 | 117 | 810 |
| 700 | 118 | 800 |
| 710 | 119 | 790 |
| 720 | 120 | 780 |
| 730 | 120 | 770 |
| 740 | 121 | 760 |
| 750 | 121 | 750 |

## AUXILIARY TABLE TO TABLES VI. AND VII.

| Difference in equation | Last Figure of Argument. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| | Add or Subtract. | | | | | | | | |
| 9 | 8 | 7 | 6 | 5 | 4 or 5 | 4 | 3 | 2 | 1 |
| 8 | 7 | 6 | 6 | 5 | 4 | 3 | 2 | 2 | 1 |
| 7 | 6 | 6 | 5 | 4 | 3 or 4 | 3 | 2 | 1 | 1 |
| 6 | 5 | 5 | 4 | 4 | 3 | 2 | 2 | 1 | 1 |
| 5 | 4 or 5 | 4 | 3 or 4 | 3 | 2 or 3 | 2 | 1 or 2 | 1 | 0 or 1 |
| 4 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 0 |
| 3 | 3 | 2 | 2 | 2 | 1 or 2 | 1 | 1 | 1 | 0 |
| 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 | 1 | 0 or 1 | 0 | 0 | 0 | 0 |

Note the difference in the (Tables VI., VII.) equation-figures for the nearest figures of the argument. Take this difference in the left-hand column of this Table, and run the eye to the right till it reaches the figure standing under the last figure of the given argument. The result is to be added to or subtracted from the equation-figure for the lower of the two argument figures, according as the scale is increasing or decreasing.

Thus; Table VI., argument 334. Difference between equations for 330 and 340 is (263 — 258) 5, decreasing. The figure in the Auxiliary Table opposite 5 and under 4 is 2. The proper equation therefore is 263 — 2 or 261.

Argument 837. Difference between 830 and 840 is (22 — 17) 5, increasing. The figure opposite 5 and under 7 is 3 or 4. The equation therefore is 17 + 3 = 20, or 17 + 4 = 21.

# TABLE VIII.

## INDICES OF TITHIS, NAKSHATRAS, AND YOGAS; AND THE KARANAS OF TITHIS

| TITHI AND KARANA | | | | | NAKSHATRA. | | | | | YOGA. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Serial number. | No. in pakasha (lunar fortnight). | Index (*t*) | Karanas. For the 1st half of the tithi. | Karanas. For the 2nd half of the tithi. | Serial number. | Name. | Index (*n*) (Ordinary system). | Index for the ending point of the Nakshatra according to the unequal space system of Garga. | Index for the ending point of the Nakshatra according to the unequal space system of Brahma Siddhânta. | Serial number. | Name. | Index (*y*) |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| | Śukla. | | | | | | | | | | | |
| 1 | 1 | 0- 333 | Kiṁstughna * | 1 Bava. | 1 | Aśvinî | 0- 370 | 370 | 366 | 1 | Vishkambha | 0- 370 |
| 2 | 2 | 333- 667 | 2 Bâlava ... | 3 Kaulava. | 2 | Bharaṇî | 370- 741 | 556 | 549 | 2 | Prîti | 370- 741 |
| 3 | 3 | 667- 1000 | 4 Taitila... | 5 Gara. | 3 | Kṛittikâ | 741- 1111 | 926 | 915 | 3 | Âyushmat | 741- 1111 |
| 4 | 4 | 1000- 1333 | 6 Vaṇij .... | 7 Vishṭi †. | 4 | Rohiṇî | 1111- 1481 | 1481 | 1464 | 4 | Saubhâgya | 1111- 1481 |
| 5 | 5 | 1333- 1667 | 1 Bava..... | 2 Bâlava. | 5 | Mṛigaśiras | 1481- 1852 | 1852 | 1830 | 5 | Śobhana | 1481- 1852 |
| 6 | 6 | 1667- 2000 | 3 Kaulava... | 4 Taitila. | 6 | Ârdrâ | 1852- 2222 | 2037 | 2013 | 6 | Atigaṇḍa | 1852- 2222 |
| 7 | 7 | 2000- 2333 | 5 Gara.... | 6 Vaṇij. | 7 | Punarvasu | 2222- 2593 | 2593 | 2562 | 7 | Sukarman | 2222- 2593 |
| 8 | 8 | 2333- 2667 | 7 Vishṭi †... | 1 Bava. | 8 | Pushya | 2593- 2963 | 2963 | 2926 | 8 | Dhṛiti | 2593- 2963 |
| 9 | 9 | 2667- 3000 | 2 Bâlava.... | 3 Kaulava. | 9 | Âśleshâ | 2963- 3333 | 3148 | 3111 | 9 | Śûla | 2963- 3333 |
| 10 | 10 | 3000- 3333 | 4 Taitila.... | 5 Gara. | 10 | Maghâ | 3333- 3704 | 3518 | 3477 | 10 | Gaṇḍa | 3333- 3704 |
| 11 | 11 | 3333- 3667 | 6 Vaṇij.... | 7 Vishṭi. | 11 | Pûrva Phalgunî | 3704- 4074 | 3888 | 3843 | 11 | Vṛiddhi | 3704- 4074 |
| 12 | 12 | 3667- 4000 | 1 Bava..... | 2 Bâlava. | 12 | Uttara Phalgunî | 4074- 4444 | 4444 | 4392 | 12 | Dhruva | 4074- 4444 |
| 13 | 13 | 4000- 4333 | 3 Kaulava... | 4 Taitila. | 13 | Hasta | 4444- 4815 | 4815 | 4756 | 13 | Vyâghâta | 4444- 4815 |
| 14 | 14 | 4333- 4667 | 5 Gara.... | 6 Vaṇij. | 14 | Chitrâ | 4815- 5185 | 5185 | 5124 | 14 | Harshaṇa | 4815- 5185 |
| 15 | 15 | 4667- 5000 | 7 Vishṭi... | 1 Bava. | 15 | Svâti | 5185- 5556 | 5370 | 5307 | 15 | Vajra | 5185- 5556 |
| | Kṛish. | | | | | | | | | | | |
| 16 | 1 | 5000- 5333 | 2 Bâlava... | 3 Kaulava. | 16 | Viśâkhâ | 5556- 5926 | 5926 | 5856 | 16 | Siddhi § | 5556- 5926 |
| 17 | 2 | 5333- 5667 | 4 Taitila... | 5 Gara. | 17 | Anurâdhâ | 5926- 6296 | 6296 | 6222 | 17 | Vyatîpâta | 5926- 6296 |
| 18 | 3 | 5667- 6000 | 6 Vaṇij... | 7 Vishṭi. | 18 | Jyeshṭhâ | 6296- 6667 | 6481 | 6405 | 18 | Varîyas | 6296- 6667 |
| 19 | 4 | 6000- 6333 | 1 Bava.... | 2 Bâlava. | 19 | Mûla | 6667- 7037 | 6852 | 6771 | 19 | Parigha | 6667- 7037 |
| 20 | 5 | 6333- 6667 | 3 Kaulava... | 4 Taitila. | 20 | Pûrva Ashâḍhâ | 7037- 7407 | 7222 | 7137 | 20 | Śiva | 7037- 7407 |
| 21 | 6 | 6667- 7000 | 5 Gara. | 6 Vaṇij. | 21 | Uttara Ashâḍhâ | 7407- 7778 | 7778 | 7686 | 21 | Siddha | 7407- 7778 |
| | | | | | | Abhijit | (7685- 7802) | | 7804 | | | |
| 22 | 7 | 7000- 7333 | 7 Vishṭi | 1 Bava. | 22 | Śravaṇa | 7778- 8148 | 8148 | 8170 | 22 | Sâdhya | 7778- 8148 |
| 23 | 8 | 7333- 7667 | 2 Bâlava... | 3 Kaulava. | 23 | Dhanishṭhâ ** | 8148- 8519 | 8519 | 8536 | 23 | Śubha | 8148- 8519 |
| 24 | 9 | 7667- 8000 | 4 Taitila.... | 5 Gara. | 24 | Śatabhishaj †† | 8519- 8889 | 8704 | 8719 | 24 | Śukla | 8519- 8889 |
| 25 | 10 | 8000- 8333 | 6 Vaṇij.... | 7 Vishṭi. | 25 | Pûrva Bhadrapadâ | 8889- 9259 | 9074 | 9085 | 25 | Brahman | 8889- 9259 |
| 26 | 11 | 8333- 8667 | 1 Bava.... | 2 Bâlava. | 26 | Uttara Bhadrapadâ | 9259- 9630 | 9630 | 9634 | 26 | Indra | 9259- 9630 |
| 27 | 12 | 8667- 9000 | 3 Kaulava | 4 Taitila. | 27 | Revatî | 9630-10000 | 10000 | 10000 | 27 | Vaidhṛiti | 9630-10000 |
| 28 | 13 | 9000- 9333 | 5 Gara. | 6 Vaṇij | — | — | — | — | — | — | — | — |
| 29 | 14 | 9333- 9667 | 7 Vishṭi | Śakuni. | — | — | — | — | — | — | — | — |
| 30 | 15 | 9667-10000 | Chatushpada. | Nâga. | — | — | — | — | — | — | — | — |

* or Kiṁstughna.

† Vishṭi is also called Bhadrâ, Kalyâṇî.

** or Śravishṭhâ.

†† or Śatatârakâ.

§ or Asṛij.

# TABLE VIII^A.

LONGITUDES OF ENDING-POINTS OF TITHIS.

| Tithi-Index (Lunation-parts) (t.) | Tithi. | Degrees. |
|---|---|---|
| 1 | 2 | 3 |
| 333 | 1 | 12° 0' |
| 667 | 2 | 24° 0' |
| 1000 | 3 | 36° 0' |
| 1333 | 4 | 48° 0' |
| 1667 | 5 | 60° 0' |
| 2000 | 6 | 72° 0' |
| 2333 | 7 | 84° 0' |
| 2667 | 8 | 96° 0' |
| 3000 | 9 | 108° 0' |
| 3333 | 10 | 120° 0' |
| 3667 | 11 | 132° 0' |
| 4000 | 12 | 144° 0' |
| 4333 | 13 | 156° 0' |
| 4667 | 14 | 168° 0' |
| 5000 | 15 | 180° 0' |
| 5333 | 16 | 192° 0' |
| 5667 | 17 | 204° 0' |
| 6000 | 18 | 216° 0' |
| 6333 | 19 | 228° 0' |
| 6667 | 20 | 240° 0' |
| 7000 | 21 | 252° 0' |
| 7333 | 22 | 264° 0' |
| 7667 | 23 | 276° 0' |
| 8000 | 24 | 288° 0' |
| 8333 | 25 | 300° 0' |
| 8667 | 26 | 312° 0' |
| 9000 | 27 | 324° 0' |
| 9333 | 28 | 336° 0' |
| 9667 | 29 | 348° 0' |
| 10000 | 30 | 360° 0' |

For longitudes of ending-points of Nakshatras and Yogas, see text, Table Art. 38.

# TABLE VIII^B.

LONGITUDES OF PARTS OF TITHIS, NAKSHATRAS AND YOGAS.

| TITHI | | | NAKSHATRA AND YOGA. | | |
|---|---|---|---|---|---|
| Tithi-Index (Lunation parts) (t.) | Tithis (and decimals). | Degrees and minutes | Nakshatra and Yoga-Index (n and y.) | Nakshatra and Yoga (and decimals) | Degrees and minutes. |
| 1 | 2 | 3 | 4 | 5 | 6 |
| 33 | 0.1 | 1° 12' | 33 | 0.09 | 1° 12' |
| 66 | 0.2 | 2° 24' | 66 | 0.18 | 2° 24' |
| 100 | 0.3 | 3° 36' | 100 | 0.27 | 3° 36' |
| 200 | 0.6 | 7° 12' | 200 | 0.54 | 7° 12' |
| 300 | 0.9 | 10° 48' | 300 | 0.81 | 10° 48' |
| 400 | 1.2 | 14° 24' | 400 | 1.08 | 14° 24' |
| 500 | 1.5 | 18° 0' | 500 | 1.35 | 18° 0' |
| 600 | 1.8 | 21° 36' | 600 | 1.62 | 21° 36' |
| 700 | 2.1 | 25° 12' | 700 | 1.89 | 25° 12' |
| 800 | 2.4 | 28° 48' | 800 | 2.16 | 28° 48' |
| 900 | 2.7 | 32° 24' | 900 | 2.43 | 32° 24' |
| 1000 | 3.0 | 36° 0' | 1000 | 2.70 | 36° 0' |
| 1100 | 3.3 | 39° 36' | 1100 | 2.97 | 39° 36' |
| 1200 | 3.6 | 43° 12' | 1200 | 3.24 | 43° 12' |
| 1300 | 3.9 | 46° 48' | 1300 | 3.51 | 46° 48' |
| 1400 | 4.2 | 50° 24' | 1400 | 3.78 | 50° 24' |
| 1500 | 4.5 | 54° 0' | 1500 | 4.05 | 54° 0' |
| 1600 | 4.8 | 57° 36' | 1600 | 4.32 | 57° 36' |
| 1700 | 5.1 | 61° 12' | 1700 | 4.59 | 61° 12' |
| 1800 | 5.4 | 64° 48' | 1800 | 4.86 | 64° 48' |
| 1900 | 5.7 | 68° 24' | 1900 | 5.13 | 68° 24' |
| 2000 | 6.0 | 72° 0' | 2000 | 5.40 | 72° 0' |
| 2100 | 6.3 | 75° 36' | 2100 | 5.67 | 75° 36' |
| 2200 | 6.6 | 79° 12' | 2200 | 5.94 | 79° 12' |
| 2300 | 6.9 | 82° 48' | 2300 | 6.21 | 82° 48' |
| 2400 | 7.2 | 86° 24' | 2400 | 6.48 | 86° 24' |
| 2500 | 7.5 | 90° 0' | 2500 | 6.75 | 90° 0' |
| 2600 | 7.8 | 93° 36' | 2600 | 7.02 | 93° 36' |
| 2700 | 8.1 | 97° 12' | 2700 | 7.29 | 97° 12' |
| 2800 | 8.4 | 100° 48' | 2800 | 7.56 | 100° 48' |
| 2900 | 8.7 | 104° 24' | 2900 | 7.83 | 104° 24' |
| 3000 | 9.0 | 108° 0' | 3000 | 8.10 | 108° 0' |
| 3100 | 9.3 | 111° 36' | 3100 | 8.37 | 111° 36' |
| 3200 | 9.6 | 115° 12' | 3200 | 8.64 | 115° 12' |
| 3300 | 9.9 | 118° 48' | 3300 | 8.91 | 118° 48' |
| 3400 | 10.2 | 122° 24' | 3400 | 9.18 | 122° 24' |

## TABLE VIII[B]. (CONTINUED.)

| TITHI. | | | NAKSHATRA AND YOGA. | | |
|---|---|---|---|---|---|
| Tithi-Index (Lunation parts) (*t*.) | Tithis (and decimals). | Degrees and minutes. | Nakshatra and Yoga-Index (*n* and *y*). | Nakshatras and Yogas (and decimals). | Degrees and minutes. |
| 1 | 2 | 3 | 4 | 5 | 6 |
| 3500 | 10.5 | 126° 0' | 3500 | 9.45 | 126° 0' |
| 3600 | 10.8 | 129° 36' | 3600 | 9.72 | 129° 36' |
| 3700 | 11.1 | 133° 12' | 3700 | 9.99 | 133° 12' |
| 3800 | 11.4 | 136° 48' | 3800 | 10.26 | 136° 48' |
| 3900 | 11.7 | 140° 24' | 3900 | 10.53 | 140° 24' |
| 4000 | 12.0 | 144° 0' | 4000 | 10.80 | 144° 0' |
| 4100 | 12.3 | 147° 36' | 4100 | 11.07 | 147° 36' |
| 4200 | 12.6 | 151° 12' | 4200 | 11.34 | 151° 12' |
| 4300 | 12.9 | 154° 48' | 4300 | 11.61 | 154° 48' |
| 4400 | 13.2 | 158° 24' | 4400 | 11.88 | 158° 24' |
| 4500 | 13.5 | 162° 0' | 4500 | 12.15 | 162° 0' |
| 4600 | 13.8 | 165° 36' | 4600 | 12.42 | 165° 36' |
| 4700 | 14.1 | 169° 12' | 4700 | 12.69 | 169° 12' |
| 4800 | 14.4 | 172° 48' | 4800 | 12.96 | 172° 48' |
| 4900 | 14.7 | 176° 24' | 4900 | 13.23 | 176° 24' |
| 5000 | 15.0 | 180° 0' | 5000 | 13.50 | 180° 0' |
| 5100 | 15.3 | 183° 36' | 5100 | 13.77 | 183° 36' |
| 5200 | 15.6 | 187° 12' | 5200 | 14.04 | 187° 12' |
| 5300 | 15.9 | 190° 48' | 5300 | 14.31 | 190° 48' |
| 5400 | 16.2 | 194° 24' | 5400 | 14.58 | 194° 24' |
| 5500 | 16.5 | 198° 0' | 5500 | 14.85 | 198° 0' |
| 5600 | 16.8 | 201° 36' | 5600 | 15.12 | 201° 36' |
| 5700 | 17.1 | 205° 12' | 5700 | 15.39 | 205° 12' |
| 5800 | 17.4 | 208° 48' | 5800 | 15.66 | 208° 48' |
| 5900 | 17.7 | 212° 24' | 5900 | 15.93 | 212° 24' |
| 6000 | 18.0 | 216° 0' | 6000 | 16.20 | 216° 0' |
| 6100 | 18.3 | 219° 36' | 6100 | 16.47 | 219° 36' |
| 6200 | 18.6 | 223° 12' | 6200 | 16.74 | 223° 12' |
| 6300 | 18.9 | 226° 48' | 6300 | 17.01 | 226° 48' |
| 6400 | 19.2 | 230° 24' | 6400 | 17.28 | 230° 24' |
| 6500 | 19.5 | 234° 0' | 6500 | 17.55 | 234° 0' |
| 6600 | 19.8 | 237° 36' | 6600 | 17.82 | 237° 36' |
| 6700 | 20.1 | 241° 12' | 6700 | 18.09 | 241° 12' |
| 6800 | 20.4 | 244° 48' | 6800 | 18.36 | 244° 48' |
| 6900 | 20.7 | 248° 24' | 6900 | 18.63 | 248° 24' |
| 7000 | 21.0 | 252° 0' | 7000 | 18.90 | 252° 0' |
| 7100 | 21.3 | 255° 36' | 7100 | 19.17 | 255° 36' |
| 7200 | 21.6 | 259° 12' | 7200 | 19.44 | 259° 12' |

## TABLE VIII[B]. (CONTINUED.)

| TITHI. | | | NAKSHATRA AND YOGA. | | |
|---|---|---|---|---|---|
| Tithi-Index (Lunation parts) (*t*.) | Tithis (and decimals). | Degrees and minutes. | Nakshatra and Yoga-Index (*n* and *y*). | Nakshatras and Yogas (and decimals). | Degrees and minutes. |
| 1 | 2 | 3 | 4 | 5 | 6 |
| 7300 | 21.9 | 262° 48' | 7300 | 19.71 | 262° 48' |
| 7400 | 22.2 | 266° 24' | 7400 | 19.98 | 266° 24' |
| 7500 | 22.5 | 270° 0' | 7500 | 20.25 | 270° 0' |
| 7600 | 22.8 | 273° 36' | 7600 | 20.52 | 273° 36' |
| 7700 | 23.1 | 277° 12' | 7700 | 20.79 | 277° 12' |
| 7800 | 23.4 | 280° 48' | 7800 | 21.06 | 280° 48' |
| 7900 | 23.7 | 284° 24' | 7900 | 21.33 | 284° 24' |
| 8000 | 24.0 | 288° 0' | 8000 | 21.60 | 288° 0' |
| 8100 | 24.3 | 291° 36' | 8100 | 21.87 | 291° 36' |
| 8200 | 24.6 | 295° 12' | 8200 | 22.14 | 295° 12' |
| 8300 | 24.9 | 298° 48' | 8300 | 22.41 | 298° 48' |
| 8400 | 25.2 | 302° 24' | 8400 | 22.68 | 302° 24' |
| 8500 | 25.5 | 306° 0' | 8500 | 22.95 | 306° 0' |
| 8600 | 25.8 | 309° 36' | 8600 | 23.22 | 309° 36' |
| 8700 | 26.1 | 313° 12' | 8700 | 23.49 | 313° 12' |
| 8800 | 26.4 | 316° 48' | 8800 | 23.76 | 316° 48' |
| 8900 | 26.7 | 320° 24' | 8900 | 24.03 | 320° 24' |
| 9000 | 27.0 | 324° 0' | 9000 | 24.30 | 324° 0' |
| 9100 | 27.3 | 327° 36' | 9100 | 24.57 | 327° 36' |
| 9200 | 27.6 | 331° 12' | 9200 | 24.84 | 331° 12' |
| 9300 | 27.9 | 334° 48' | 9300 | 25.11 | 334° 48' |
| 9400 | 28.2 | 338° 24' | 9400 | 25.38 | 338° 24' |
| 9500 | 28.5 | 342° 0' | 9500 | 25.65 | 342° 0' |
| 9600 | 28.8 | 345° 36' | 9600 | 25.92 | 345° 36' |
| 9700 | 29.1 | 349° 12' | 9700 | 26.19 | 349° 12' |
| 9800 | 29.4 | 352° 48' | 9800 | 26.46 | 352° 48' |
| 9900 | 29.7 | 356° 24' | 9900 | 26.73 | 356° 24' |
| 10000 | 30.0 | 360° 0' | 10000 | 27.00 | 360° 0' |

# TABLE IX.

TABLE GIVING THE SERIAL NUMBER OF DAYS FROM THE END OF A YEAR A.D. FOR TWO CONSECUTIVE A.D. YEARS.

Part I.

Number of days reckoned from the 1st of January of the same year.

| | Jan. | Feb. | March. | April. | May. | June. | July. | Aug. | Sep. | Oct. | Nov. | Dec. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 32 | 60 | 91 | 121 | 152 | 182 | 213 | 244 | 274 | 305 | 335 | 1 |
| 2 | 2 | 33 | 61 | 92 | 122 | 153 | 183 | 214 | 245 | 275 | 306 | 336 | 2 |
| 3 | 3 | 34 | 62 | 93 | 123 | 154 | 184 | 215 | 246 | 276 | 307 | 337 | 3 |
| 4 | 4 | 35 | 63 | 94 | 124 | 155 | 185 | 216 | 247 | 277 | 308 | 338 | 4 |
| 5 | 5 | 36 | 64 | 95 | 125 | 156 | 186 | 217 | 248 | 278 | 309 | 339 | 5 |
| 6 | 6 | 37 | 65 | 96 | 126 | 157 | 187 | 218 | 249 | 279 | 310 | 340 | 6 |
| 7 | 7 | 38 | 66 | 97 | 127 | 158 | 188 | 219 | 250 | 280 | 311 | 341 | 7 |
| 8 | 8 | 39 | 67 | 98 | 128 | 159 | 189 | 220 | 251 | 281 | 312 | 342 | 8 |
| 9 | 9 | 40 | 68 | 99 | 129 | 160 | 190 | 221 | 252 | 282 | 313 | 343 | 9 |
| 10 | 10 | 41 | 69 | 100 | 130 | 161 | 191 | 222 | 253 | 283 | 314 | 344 | 10 |
| 11 | 11 | 42 | 70 | 101 | 131 | 162 | 192 | 223 | 254 | 284 | 315 | 345 | 11 |
| 12 | 12 | 43 | 71 | 102 | 132 | 163 | 193 | 224 | 255 | 285 | 316 | 346 | 12 |
| 13 | 13 | 44 | 72 | 103 | 133 | 164 | 194 | 225 | 256 | 286 | 317 | 347 | 13 |
| 14 | 14 | 45 | 73 | 104 | 134 | 165 | 195 | 226 | 257 | 287 | 318 | 348 | 14 |
| 15 | 15 | 46 | 74 | 105 | 135 | 166 | 196 | 227 | 258 | 288 | 319 | 349 | 15 |
| 16 | 16 | 47 | 75 | 106 | 136 | 167 | 197 | 228 | 259 | 289 | 320 | 350 | 16 |
| 17 | 17 | 48 | 76 | 107 | 137 | 168 | 198 | 229 | 260 | 290 | 321 | 351 | 17 |
| 18 | 18 | 49 | 77 | 108 | 138 | 169 | 199 | 230 | 261 | 291 | 322 | 352 | 18 |
| 19 | 19 | 50 | 78 | 109 | 139 | 170 | 200 | 231 | 262 | 292 | 323 | 353 | 19 |
| 20 | 20 | 51 | 79 | 110 | 140 | 171 | 201 | 232 | 263 | 293 | 324 | 354 | 20 |
| 21 | 21 | 52 | 80 | 111 | 141 | 172 | 202 | 233 | 264 | 294 | 325 | 355 | 21 |
| 22 | 22 | 53 | 81 | 112 | 142 | 173 | 203 | 234 | 265 | 295 | 326 | 356 | 22 |
| 23 | 23 | 54 | 82 | 113 | 143 | 174 | 204 | 235 | 266 | 296 | 327 | 357 | 23 |
| 24 | 24 | 55 | 83 | 114 | 144 | 175 | 205 | 236 | 267 | 297 | 328 | 358 | 24 |
| 25 | 25 | 56 | 84 | 115 | 145 | 176 | 206 | 237 | 268 | 298 | 329 | 359 | 25 |
| 26 | 26 | 57 | 85 | 116 | 146 | 177 | 207 | 238 | 269 | 299 | 330 | 360 | 26 |
| 27 | 27 | 58 | 86 | 117 | 147 | 178 | 208 | 239 | 270 | 300 | 331 | 361 | 27 |
| 28 | 28 | 59 | 87 | 118 | 148 | 179 | 209 | 240 | 271 | 301 | 332 | 362 | 28 |
| 29 | 29 | 60 | 88 | 119 | 149 | 180 | 210 | 241 | 272 | 302 | 333 | 363 | 29 |
| 30 | 30 | — | 89 | 120 | 150 | 181 | 211 | 242 | 273 | 303 | 334 | 364 | 30 |
| 31 | 31 | — | 90 | — | 151 | — | 212 | 243 | — | 304 | — | 365 | 31 |
| | Jan. | Feb. | March. | April | May. | June | July. | Aug. | Sep. | Oct. | Nov. | Dec. | |

# TABLE IX. (CONTINUED.)

TABLE GIVING THE SERIAL NUMBER OF DAYS FROM THE END OF A YEAR A.D. FOR TWO CONSECUTIVE A.D. YEARS.

PART II.

Number of days reckoned from the 1st of January of the preceding year.

| | Jan. | Feb. | March. | April. | May. | June. | July. | Aug. | Sep. | Oct. | Nov. | Dec. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 366 | 397 | 425 | 456 | 486 | 517 | 547 | 578 | 609 | 639 | 670 | 700 | 1 |
| 2 | 367 | 398 | 426 | 457 | 487 | 518 | 548 | 579 | 610 | 640 | 671 | 701 | 2 |
| 3 | 368 | 399 | 427 | 458 | 488 | 519 | 549 | 580 | 611 | 641 | 672 | 702 | 3 |
| 4 | 369 | 400 | 428 | 459 | 489 | 520 | 550 | 581 | 612 | 642 | 673 | 703 | 4 |
| 5 | 370 | 401 | 429 | 460 | 490 | 521 | 551 | 582 | 613 | 643 | 674 | 704 | 5 |
| 6 | 371 | 402 | 430 | 461 | 491 | 522 | 552 | 583 | 614 | 644 | 675 | 705 | 6 |
| 7 | 372 | 403 | 431 | 462 | 492 | 523 | 553 | 584 | 615 | 645 | 676 | 706 | 7 |
| 8 | 373 | 404 | 432 | 463 | 493 | 524 | 554 | 585 | 616 | 646 | 677 | 707 | 8 |
| 9 | 374 | 405 | 433 | 464 | 494 | 525 | 555 | 586 | 617 | 647 | 678 | 708 | 9 |
| 10 | 375 | 406 | 434 | 465 | 495 | 526 | 556 | 587 | 618 | 648 | 679 | 709 | 10 |
| 11 | 376 | 407 | 435 | 466 | 496 | 527 | 557 | 588 | 619 | 649 | 680 | 710 | 11 |
| 12 | 377 | 408 | 436 | 467 | 497 | 528 | 558 | 589 | 620 | 650 | 681 | 711 | 12 |
| 13 | 378 | 409 | 437 | 468 | 498 | 529 | 559 | 590 | 621 | 651 | 682 | 712 | 13 |
| 14 | 379 | 410 | 438 | 469 | 499 | 530 | 560 | 591 | 622 | 652 | 683 | 713 | 14 |
| 15 | 380 | 411 | 439 | 470 | 500 | 531 | 561 | 592 | 623 | 653 | 684 | 714 | 15 |
| 16 | 381 | 412 | 440 | 471 | 501 | 532 | 562 | 593 | 624 | 654 | 685 | 715 | 16 |
| 17 | 382 | 413 | 441 | 472 | 502 | 533 | 563 | 594 | 625 | 655 | 686 | 716 | 17 |
| 18 | 383 | 414 | 442 | 473 | 503 | 534 | 564 | 595 | 626 | 656 | 687 | 717 | 18 |
| 19 | 384 | 415 | 443 | 474 | 504 | 535 | 565 | 596 | 627 | 657 | 688 | 718 | 19 |
| 20 | 385 | 416 | 444 | 475 | 505 | 536 | 566 | 597 | 628 | 658 | 689 | 719 | 20 |
| 21 | 386 | 417 | 445 | 476 | 506 | 537 | 567 | 598 | 629 | 659 | 690 | 720 | 21 |
| 22 | 387 | 418 | 446 | 477 | 507 | 538 | 568 | 599 | 630 | 660 | 691 | 721 | 22 |
| 23 | 388 | 419 | 447 | 478 | 508 | 539 | 569 | 600 | 631 | 661 | 692 | 722 | 23 |
| 24 | 389 | 420 | 448 | 479 | 509 | 540 | 570 | 601 | 632 | 662 | 693 | 723 | 24 |
| 25 | 390 | 421 | 449 | 480 | 510 | 541 | 571 | 602 | 633 | 663 | 694 | 724 | 25 |
| 26 | 391 | 422 | 450 | 481 | 511 | 542 | 572 | 603 | 634 | 664 | 695 | 725 | 26 |
| 27 | 392 | 423 | 451 | 482 | 512 | 543 | 573 | 604 | 635 | 665 | 696 | 726 | 27 |
| 28 | 393 | 424 | 452 | 483 | 513 | 544 | 574 | 605 | 636 | 666 | 697 | 727 | 28 |
| 29 | 394 | 425 | 453 | 484 | 514 | 545 | 575 | 606 | 637 | 667 | 698 | 728 | 29 |
| 30 | 395 | — | 454 | 485 | 515 | 546 | 576 | 607 | 638 | 668 | 699 | 729 | 30 |
| 31 | 396 | — | 455 | — | 516 | — | 577 | 608 | — | 669 | — | 730 | 31 |
| | Jan. | Feb. | March. | April. | May. | June. | July. | Aug. | Sep. | Oct. | Nov. | Dec. | |

# TABLE X.

## FOR CONVERTING TITHI-PARTS, AND INDICES OF TITHIS, NAKSHATRAS, AND YOGAS INTO TIME

[N.B. In this Table a tithi is supposed to contain.................. 1,000 parts.
" " " " lunation " " " " .................. 10,000 "
" " " " sidereal month " " " " .................. 10,000 "
" " " " yoga chakra " " " " .................. 10,000 "

Therefore:

In the case of Tithi-parts the argument shews.................. 1,000ths of a tithi.
" " " " Tithi-index (t) " " " .................. 10,000ths " " lunation.
" " " " Nakshatra-index (n) " " " .................. 10,000ths " " sidereal month.
" " " " Yoga-index (y) " " " .................. 10,000ths " " yoga-chakra.]

| Argument | Time equivalent of | | | | | | | | Argument | Time equivalent of | | | | | | | | Argument | Time equivalent of | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Tithi-parts. | | Tithi-index (t). | | Nakshatra-index (n). | | Yoga-index (y). | | | Tithi-parts. | | Tithi-index (t). | | Nakshatra-index (n). | | Yoga-index (y). | | | Tithi-parts. | | Tithi-index (t). | | Nakshatra-index (n). | | Yoga-index (y). | |
| | H. | M. | H. | M. | H. | M. | H. | M. | | H. | M. | H. | M. | H. | M. | H. | M. | | H. | M. | H. | M. | H. | M. | H. | M. |
| 1 | 0 | 1 | 0 | 4 | 0 | 4 | 0 | 4 | 41 | 0 | 58 | 2 | 54 | 2 | 41 | 2 | 30 | 81 | 1 | 55 | 5 | 44 | 5 | 19 | 4 | 57 |
| 2 | 0 | 3 | 0 | 9 | 0 | 8 | 0 | 7 | 42 | 1 | 0 | 2 | 59 | 2 | 45 | 2 | 34 | 82 | 1 | 56 | 5 | 49 | 5 | 23 | 5 | 0 |
| 3 | 0 | 4 | 0 | 13 | 0 | 12 | 0 | 11 | 43 | 1 | 1 | 3 | 3 | 2 | 49 | 2 | 37 | 83 | 1 | 58 | 5 | 53 | 5 | 27 | 5 | 4 |
| 4 | 0 | 6 | 0 | 17 | 0 | 16 | 0 | 15 | 44 | 1 | 2 | 3 | 7 | 2 | 53 | 2 | 41 | 84 | 1 | 59 | 5 | 57 | 5 | 30 | 5 | 7 |
| 5 | 0 | 7 | 0 | 21 | 0 | 20 | 0 | 18 | 45 | 1 | 4 | 3 | 11 | 2 | 57 | 2 | 45 | 85 | 2 | 0 | 6 | 1 | 5 | 34 | 5 | 11 |
| 6 | 0 | 9 | 0 | 26 | 0 | 24 | 0 | 22 | 46 | 1 | 5 | 3 | 16 | 3 | 1 | 2 | 48 | 86 | 2 | 2 | 6 | 6 | 5 | 38 | 5 | 15 |
| 7 | 0 | 10 | 0 | 30 | 0 | 28 | 0 | 26 | 47 | 1 | 7 | 3 | 20 | 3 | 5 | 2 | 52 | 87 | 2 | 3 | 6 | 10 | 5 | 42 | 5 | 18 |
| 8 | 0 | 11 | 0 | 34 | 0 | 31 | 0 | 29 | 48 | 1 | 8 | 3 | 24 | 3 | 9 | 2 | 56 | 88 | 2 | 5 | 6 | 14 | 5 | 46 | 5 | 22 |
| 9 | 0 | 13 | 0 | 38 | 0 | 35 | 0 | 33 | 49 | 1 | 9 | 3 | 28 | 3 | 13 | 2 | 59 | 89 | 2 | 6 | 6 | 18 | 5 | 50 | 5 | 26 |
| 10 | 0 | 14 | 0 | 43 | 0 | 39 | 0 | 37 | 50 | 1 | 11 | 3 | 33 | 3 | 17 | 3 | 3 | 90 | 2 | 8 | 6 | 23 | 5 | 54 | 5 | 29 |
| 11 | 0 | 16 | 0 | 47 | 0 | 43 | 0 | 40 | 51 | 1 | 12 | 3 | 37 | 3 | 21 | 3 | 7 | 91 | 2 | 9 | 6 | 27 | 5 | 58 | 5 | 33 |
| 12 | 0 | 17 | 0 | 51 | 0 | 47 | 0 | 44 | 52 | 1 | 14 | 3 | 41 | 3 | 25 | 3 | 10 | 92 | 2 | 10 | 6 | 31 | 6 | 2 | 5 | 37 |
| 13 | 0 | 18 | 0 | 55 | 0 | 51 | 0 | 48 | 53 | 1 | 15 | 3 | 45 | 3 | 29 | 3 | 14 | 93 | 2 | 12 | 6 | 35 | 6 | 6 | 5 | 40 |
| 14 | 0 | 20 | 1 | 0 | 0 | 55 | 0 | 51 | 54 | 1 | 17 | 3 | 50 | 3 | 32 | 3 | 18 | 94 | 2 | 13 | 6 | 40 | 6 | 10 | 5 | 44 |
| 15 | 0 | 21 | 1 | 4 | 0 | 59 | 0 | 55 | 55 | 1 | 18 | 3 | 54 | 3 | 36 | 3 | 21 | 95 | 2 | 15 | 6 | 44 | 6 | 14 | 5 | 48 |
| 16 | 0 | 23 | 1 | 8 | 1 | 3 | 0 | 59 | 56 | 1 | 19 | 3 | 58 | 3 | 40 | 3 | 25 | 96 | 2 | 16 | 6 | 48 | 6 | 18 | 5 | 51 |
| 17 | 0 | 24 | 1 | 12 | 1 | 7 | 1 | 2 | 57 | 1 | 21 | 4 | 2 | 3 | 44 | 3 | 29 | 97 | 2 | 17 | 6 | 52 | 6 | 22 | 5 | 55 |
| 18 | 0 | 26 | 1 | 17 | 1 | 11 | 1 | 6 | 58 | 1 | 22 | 4 | 7 | 3 | 48 | 3 | 32 | 98 | 2 | 19 | 6 | 57 | 6 | 26 | 5 | 59 |
| 19 | 0 | 27 | 1 | 21 | 1 | 15 | 1 | 10 | 59 | 1 | 24 | 4 | 11 | 3 | 52 | 3 | 36 | 99 | 2 | 20 | 7 | 1 | 6 | 29 | 6 | 2 |
| 20 | 0 | 28 | 1 | 25 | 1 | 19 | 1 | 13 | 60 | 1 | 25 | 4 | 15 | 3 | 56 | 3 | 40 | 100 | 2 | 22 | 7 | 5 | 6 | 33 | 6 | 6 |
| 21 | 0 | 30 | 1 | 29 | 1 | 23 | 1 | 17 | 61 | 1 | 26 | 4 | 19 | 4 | 0 | 3 | 43 | 200 | 4 | 43 | 14 | 10 | 13 | 7 | 12 | 12 |
| 22 | 0 | 31 | 1 | 34 | 1 | 27 | 1 | 21 | 62 | 1 | 28 | 4 | 24 | 4 | 4 | 3 | 47 | 300 | 7 | 5 | 21 | 16 | 19 | 40 | 18 | 18 |
| 23 | 0 | 33 | 1 | 38 | 1 | 30 | 1 | 24 | 63 | 1 | 29 | 4 | 28 | 4 | 8 | 3 | 51 | 400 | 9 | 27 | 28 | 21 | — | — | — | — |
| 24 | 0 | 34 | 1 | 42 | 1 | 34 | 1 | 28 | 64 | 1 | 31 | 4 | 32 | 4 | 12 | 3 | 54 | 500 | 11 | 49 | 35 | 26 | — | — | — | — |
| 25 | 0 | 35 | 1 | 46 | 1 | 38 | 1 | 32 | 65 | 1 | 32 | 4 | 36 | 4 | 16 | 3 | 58 | 600 | 14 | 10 | 42 | 31 | — | — | — | — |
| 26 | 0 | 37 | 1 | 51 | 1 | 42 | 1 | 35 | 66 | 1 | 34 | 4 | 41 | 4 | 20 | 4 | 2 | 700 | 16 | 32 | 49 | 37 | — | — | — | — |
| 27 | 0 | 38 | 1 | 55 | 1 | 46 | 1 | 39 | 67 | 1 | 35 | 4 | 45 | 4 | 24 | 4 | 5 | 800 | 18 | 54 | 56 | 42 | — | — | — | — |
| 28 | 0 | 40 | 1 | 59 | 1 | 50 | 1 | 42 | 68 | 1 | 36 | 4 | 49 | 4 | 28 | 4 | 9 | 900 | 21 | 16 | 63 | 47 | — | — | — | — |
| 29 | 0 | 41 | 2 | 3 | 1 | 54 | 1 | 46 | 69 | 1 | 38 | 4 | 53 | 4 | 31 | 4 | 13 | 1000 | 23 | 37 | 70 | 52 | — | — | — | — |
| 30 | 0 | 43 | 2 | 8 | 1 | 58 | 1 | 50 | 70 | 1 | 39 | 4 | 58 | 4 | 35 | 4 | 16 | | | | | | | | | |
| 31 | 0 | 44 | 2 | 12 | 2 | 2 | 1 | 53 | 71 | 1 | 41 | 5 | 2 | 4 | 39 | 4 | 20 | | | | | | | | | |
| 32 | 0 | 45 | 2 | 16 | 2 | 6 | 1 | 57 | 72 | 1 | 42 | 5 | 6 | 4 | 43 | 4 | 24 | | | | | | | | | |
| 33 | 0 | 47 | 2 | 20 | 2 | 10 | 2 | 1 | 73 | 1 | 43 | 5 | 10 | 4 | 47 | 4 | 27 | | | | | | | | | |
| 34 | 0 | 48 | 2 | 25 | 2 | 14 | 2 | 4 | 74 | 1 | 45 | 5 | 15 | 4 | 51 | 4 | 31 | | | | | | | | | |
| 35 | 0 | 50 | 2 | 29 | 2 | 18 | 2 | 8 | 75 | 1 | 46 | 5 | 19 | 4 | 55 | 4 | 35 | | | | | | | | | |
| 36 | 0 | 51 | 2 | 33 | 2 | 22 | 2 | 12 | 76 | 1 | 48 | 5 | 23 | 4 | 59 | 4 | 38 | | | | | | | | | |
| 37 | 0 | 52 | 2 | 37 | 2 | 26 | 2 | 15 | 77 | 1 | 49 | 5 | 27 | 5 | 3 | 4 | 42 | | | | | | | | | |
| 38 | 0 | 54 | 2 | 42 | 2 | 30 | 2 | 19 | 78 | 1 | 51 | 5 | 32 | 5 | 7 | 4 | 46 | | | | | | | | | |
| 39 | 0 | 55 | 2 | 46 | 2 | 33 | 2 | 23 | 79 | 1 | 52 | 5 | 36 | 5 | 11 | 4 | 49 | | | | | | | | | |
| 40 | 0 | 57 | 2 | 50 | 2 | 37 | 2 | 26 | 80 | 1 | 53 | 5 | 40 | 5 | 15 | 4 | 53 | | | | | | | | | |

# TABLE XI.

## LATITUDES AND LONGITUDES OF PRINCIPAL PLACES.

*(Latitudes and longitudes in degrees and minutes: Longitudes in minutes of time, being the difference in time between Ujjain and the place in question.)*

[N.B. This Table is based on the maps of the Great Trigonometrical Survey of India, but all longitudes require a correction of — 3' 39" to bring them to the latest corrected longitude of the Madras Observatory, namely, 80° 14' 51".]

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To convert Ujjain mean time, as found by the previous Tables, into local mean time, add to or subtract from the former the minutes of longitude of the place in question, as indicated by the sign of plus or minus in this Table.

| NAME OF PLACE. | N. Latitude. | Long. E. from Greenwich. | Long. from Ujjain in minutes of time. |
|---|---|---|---|
| Abû (Arbuda)................ | 24° 36' | 72° 50' | — 12 |
| Âgra (Fort).................. | 27° 10' | 78° 5' | + 9 |
| Ahmadâbâd.................. | 23° 1' | 72° 39' | — 13 |
| Ahmadnagar.................. | 19° 4' | 74° 48' | — 4 |
| Ajanta......................... | 20° 32' | 75° 49' | — 0 |
| Âjmêr......................... | 26° 30' | 74° 45' | — 4 |
| Alîgaḍh (Allyghur, Coel)...... | 27° 52' | 78° 8' | + 9 |
| Allahâbâd (Prayâga).......... | 25° 26' | 81° 54' | + 24 |
| Amarâvatî (on the Krishṇâ)... | 16° 34' | 80° 25' | + 18 |
| Amarâvatî (Amrâoti, Oomrawattee, in Berar)........ | 20° 55' | 77° 49' | + 8 |
| Amritsar....................... | 31° 37' | 74° 56' | — 4 |
| Aṇhilvâḍ (Pâṭan)............. | 23° 51' | 72° 11' | — 15 |
| Arcot (Ârkâḍu)................ | 12° 54' | 79° 24' | + 14 |
| Aurangâbâd.................... | 19° 54' | 75° 24' | — 2 |
| Ayodhyâ (*see* Oude).......... | — | — | — |
| Bâdâmi........................ | 15° 55' | 75° 45' | — 0 |
| Balagâvi, or Balagâdive....... | 14° 23' | 75° 18' | — 2 |
| Banavâsi...................... | 14° 32' | 75° 5' | — 3 |
| Bardhvân (Bardwan).......... | 23° 14' | 87° 55' | + 49 |
| Baroda (Baḍôdâ).............. | 22° 18' | 73° 16' | — 10 |
| Bârsî.......................... | 18° 13' | 75° 46' | — 0 |
| Belgaum...................... | 15° 51' | 74° 35' | — 5 |
| Benares....................... | 25° 19' | 83° 4' | + 29 |
| Bhâgalpur (Bengal)........... | 25° 15' | 87° 2' | + 45 |
| Bharatpur (Bhurtpoor)........ | 27° 13' | 77° 33' | + 7 |
| Bhelsâ......................... | 23° 32' | 77° 52' | + 8 |
| Bhopâl........................ | 23° 15' | 77° 28' | + 6 |
| Bihar (Behar, in Bengal)...... | 25° 11' | 85° 35' | + 39 |
| Bîjâpur (Beejapoor).......... | 16° 50' | 75° 47' | — 0 |
| Bijnagar (*see* Vijayanagar).... | — | — | — |
| Bîkânêr....................... | 28° 0' | 73° 22' | — 10 |
| Bombay (Gt. Trig. Station)... | 18° 54' | 72° 52' | — 12 |
| Broach (Bhrigukachha)........ | 21° 42' | 73° 2' | — 11 |
| Bundi.......................... | 25° 26' | 75° 42' | — 1 |
| Burhânpur..................... | 21° 19' | 76° 18' | + 2 |
| Calcutta (Fort William)....... | 22° 33' | 88° 24' | + 50 |
| Calingapatam (*see* Kaliṅgapaṭṭam) | — | — | — |
| Cambay (Khambât, Sthambhatîrtha) | 22° 18' | 72° 41' | — 12 |
| Cawnpore (Kânhpur, Old City). | 26° 29' | 80° 22' | + 18 |
| Cochin........................ | 9° 58' | 76° 16' | + 2 |
| Congeveram (*see* Kâñchî)..... | — | — | — |
| Cuttack (*see* Kaṭak).......... | — | — | — |
| Dacca (Dhâkâ)................ | 23° 43' | 90° 27' | + 58 |
| Dehli (Delhi, Old City)....... | 28° 39' | 77° 15' | + 6 |
| Devagiri (Daulatâbâd)........ | 19° 57' | 75° 17' | — 2 |
| Dhârâ (Dhar).................. | 22° 36' | 75° 22' | — 2 |
| Dhârvâḍ (Dharwar)........... | 15° 27' | 75° 5' | — 3 |
| Dhôlpur (City)................ | 26° 41' | 77° 56' | + 9 |
| Dhulia......................... | 20° 54' | 74° 50' | — 4 |
| Dvârakâ....................... | 22° 14' | 69° 2' | — 27 |
| Ellora (Vêlâpura)............. | 20° 2' | 75° 14' | — 2 |
| Farukhâbâd (Furruck°.)....... | 27° 23' | 79° 37' | + 15 |
| Gayâ.......................... | 24° 47' | 85° 4' | + 37 |
| Ghâzîpur...................... | 25° 35' | 83° 39' | + 31 |
| Girnâr........................ | 21° 32' | 70° 38' | — 21 |
| Goa (Gôpakapaṭṭana)......... | 15° 30' | 73° 57' | — 5 |
| Gôrakhapur (Goruckpoor)..... | 26° 45' | 83° 25' | + 30 |
| Gurkhâ........................ | 27° 55' | 84° 30' | + 35 |
| Gwalior....................... | 26° 14' | 78° 14' | + 10 |
| Haidarâbâd (Dekhan)......... | 17° 22' | 78° 32' | + 11 |
| Haidarâbâd (Sindh)........... | 25° 23' | 68° 26' | — 30 |
| Hardâ (in Gwalior)........... | 22° 20' | 77° 0' | + 5 |
| Hardwâr...................... | 29° 57' | 78° 14' | + 10 |

# TABLE XI. (CONTINUED)

| NAME OF PLACE | N. Latitude. | Long. E from Greenwich. | Long. from Ujjain in minutes of time. |
|---|---|---|---|
| Hoshangābād | 22° 45′ | 77° 47′ | + 8 |
| Indore | 22° 43′ | 75° 55′ | — 0 |
| Jabalpur (Jubbulpore) | 23° 11′ | 80° 0′ | — 17 |
| Jaganāthapurī | 19° 48′ | 85° 53′ | + 40 |
| Jalgaum | 21° 1′ | 75° 38′ | — 1 |
| Jaypur (Jeypore, in Rājputāna) | 26° 55′ | 75° 53′ | — 0 |
| Jhānsī | 25° 28′ | 78° 38′ | + 11 |
| Jōdhpur | 26° 18′ | 73° 5′ | — 11 |
| Junāgaḍh | 21° 31′ | 70° 31′ | — 21 |
| Kalingapatam (Coliugapatam) | 18° 20′ | 84° 11′ | + 33 |
| Kalyān (Bombay) | 19° 15′ | 73° 11′ | — 11 |
| Kalyān (Kalliaunee, Nizam's Dominions) | 17° 53′ | 77° 1′ | + 5 |
| Kanauj | 27° 3′ | 79° 59′ | + 17 |
| Kāñchī (or Congeveram) | 12° 50′ | 79° 46′ | + 16 |
| Kaṭak (Cuttack) | 20° 28′ | 85° 56′ | + 40 |
| Khātmāṇḍu | 27° 39′ | 85° 19′ | + 38 |
| Kōlāpur (Kolhapur) | 16° 41′ | 74° 17′ | — 6 |
| Lāhōr (Lahore) | 31° 35′ | 74° 23′ | — 6 |
| Lakhnau (Lucknow) | 26° 51′ | 80° 58′ | + 21 |
| Madhura (Madura, Madras Pres.) | 9° 55′ | 78° 11′ | + 9 |
| Madras (Observatory) [1] | 13° 4′ | 80° 18⅓′ | + 18 |
| Maisūr (Mysore) | 12° 18′ | 76° 43′ | + 4 |
| Malkhēḍ (Mānyakhēṭa) | 17° 12′ | 77° 13′ | + 6 |
| Māṇḍavī (in Cutch) | 22° 50′ | 69° 25′ | — 26 |
| Mangalūr (Mangalore) | 12° 52′ | 74° 54′ | — 4 |
| Mathurā (Muttra N.W.P.) | 27° 30′ | 77° 45′ | + 8 |
| Mungīr (or Mungēr) | 25° 23′ | 86° 32′ | + 43 |
| Multān (Mooltan) | 30° 12′ | 71° 32′ | — 17 |
| Nāgpur (Nagpore) | 21° 9′ | 79° 10′ | + 13 |
| Nāsik | 20° 0′ | 73° 51′ | — 8 |
| Oomrawuttee (see Amarāvatī) | — | — | — |
| Oude (Oudh, Ayōdhyā) | 26° 48′ | 82° 16′ | + 26 |
| Paithān | 19° 29′ | 75° 27′ | — 2 |
| Paṇḍharpūr | 17° 41′ | 75° 24′ | — 2 |
| Pāṭan (see Aṇhilwaḍ) | — | — | — |
| Paṭan (see Somnāthpaṭan) | — | — | — |
| Patiālā | 30° 19′ | 76° 28′ | + 3 |
| Pāṭṇa | 25° 36′ | 85° 16′ | + 37 |
| Peshawar | 34° 0′ | 71° 40′ | — 17 |
| Poona (Puṇēṃ) | 18° 30′ | 73° 55′ | — 8 |
| Pooree (Purī, see Jagannāthapurī) | — | — | — |
| Purṇiyā (Poorneah) | 25° 48′ | 87° 34′ | + 47 |
| Rāmēśvaram (Rameshwar) | 9° 17′ | 79° 23′ | + 14 |
| Ratnāgiri | 17° 0′ | 73° 21′ | — 10 |
| Rēwā (Rewa, Rīwāh) | 24° 31′ | 81° 21′ | + 22 |
| Sāgar (Saugor) | 23° 50′ | 78° 48′ | + 12 |
| Sahet Mahet (Śrāvastī) [2] | 27° 31′ | 82° 5′ | + 25 |
| Sambhalpur (Sumbulpore) | 21° 28′ | 84° 2′ | + 33 |
| Sātārā | 17° 41′ | 74° 3′ | — 7 |
| Seringapatam (Śrīraṅgapattaṇa) | 12° 25′ | 76° 44′ | + 4 |
| Shōlāpur | 17° 41′ | 75° 56′ | + 1 |
| Sirōnj | 24° 6′ | 77° 45′ | + 8 |
| Somnāthpaṭan | 20° 53′ | 70° 28′ | — 22 |
| Śrīnagar (in Kashmir) | 34° 0′ | 74° 52′ | — 4 |
| Surat | 21° 12′ | 72° 53′ | — 12 |
| Tanjore (Tañjāvūr) | 10° 47′ | 79° 12′ | + 14 |
| Ṭhāṇā (Tannah) | 19° 12′ | 73° 1′ | — 11 |
| Travancore (Tiruvaṅkōḍu) | 8° 14′ | 77° 19′ | + 6 |
| Trichinopoly | 10° 49′ | 78° 45′ | + 12 |
| Trivandrum | 8° 29′ | 77° 0′ | + 5 |
| Udaipur (Oodeypore) | 24° 34′ | 73° 45′ | — 8 |
| Ujjain [3] | 23° 11′ | 75° 50′ | ± 0 |
| Vijayanagar | 15° 19′ | 76° 32′ | + 3 |

[1] The longitude of the Madras Observatory, which forms the basis of the Indian Geographical surveys, has been lately corrected to 80° 14′ 51″.

[2] Sahet Mahet is not on the Survey of India map. The particulars are taken from the Imperial Gazetteer.

[3] With the correction noted in note 1 above (— 3′ 39″) the longitude of Ujjain comes to 75° 46′ 6″.

# TABLE XII.

*(See Arts. 53 to 63.)*

| Samvatsaras of the 60-year cycle of Jupiter. | Samvatsara of the twelve-year cycle of the mean-sign system. Corresponding to the samvatsara of the sixty-year cycle of the mean-sign system. | Mean-sign of Jupiter by his mean longitude. Corresponding to the samvatsara of the sixty-year cycle of the mean-sign system. | Samvatsaras of the 60-year cycle of Jupiter. | Samvatsara of the twelve-year cycle of the mean-sign system. Corresponding to the samvatsara of the sixty-year cycle of the mean-sign system. | Mean-sign of Jupiter by his mean longitude. Corresponding to the samvatsara of the sixty-year cycle of the mean-sign system. |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 1 | 2 | 3 |
| 1 Prabhava...... | 5 Śrâvaṇa........ | 11 Kumbha. | 31 Hemalamba.... | 11 Mâgha........ | 5 Siṁha. |
| 2 Vibhava....... | 6 Bhâdrapada.... | 12 Mîna. | 32 Vilamba...... | 12 Phâlguna...... | 6 Kanyâ. |
| 3 Śukla......... | 7 Âśvina........ | 1 Mesha. | 33 Vikârin....... | 1 Chaitra....... | 7 Tulâ. |
| 4 Pramoda....... | 8 Kârttika...... | 2 Vrishabha. | 34 Śârvari....... | 2 Vaiśâkha...... | 8 Vṛiśchika. |
| 5 Prajâpati..... | 9 Mârgaśîrsha... | 3 Mithuna. | 35 Plava......... | 3 Jyeshṭha...... | 9 Dhanus. |
| 6 Aṅgiras....... | 10 Pausha........ | 4 Karka. | 36 Śubhakṛit..... | 4 Âshâḍha...... | 10 Makara. |
| 7 Śrîmukha...... | 11 Mâgha......... | 5 Siṁha. | 37 Śobhana....... | 5 Śrâvaṇa....... | 11 Kumbha. |
| 8 Bhâva......... | 12 Phâlguna...... | 6 Kanyâ. | 38 Krodhin....... | 6 Bhâdrapada.... | 12 Mîna. |
| 9 Yuvan......... | 1 Chaitra....... | 7 Tulâ. | 39 Viśvâvasu..... | 7 Âśvina........ | 1 Mesha. |
| 10 Dhâtri........ | 2 Vaiśâkha...... | 8 Vṛiśchika. | 40 Parâbhava..... | 8 Kârttika...... | 2 Vrishabha. |
| 11 Îśvara........ | 3 Jyeshṭha...... | 9 Dhanus. | 41 Plavaṅga...... | 9 Mârgaśîrsha... | 3 Mithuna. |
| 12 Bahudhânya.... | 4 Âshâḍha....... | 10 Makara. | 42 Kîlaka........ | 10 Pausha........ | 4 Karka. |
| 13 Pramâthin..... | 5 Śrâvaṇa........ | 11 Kumbha. | 43 Saumya........ | 11 Mâgha......... | 5 Siṁha. |
| 14 Vikrama....... | 6 Bhâdrapada..... | 12 Mîna. | 44 Sâdhâraṇa..... | 12 Phâlguna...... | 6 Kanyâ. |
| 15 Vrisha........ | 7 Âśvina........ | 1 Mesha. | 45 Virodhakṛit.... | 1 Chaitra....... | 7 Tulâ. |
| 16 Chitrabhânu... | 8 Kârttika...... | 2 Vrishabha. | 46 Paridhâvin.... | 2 Vaiśâkha...... | 8 Vṛiśchika. |
| 17 Subhânu....... | 9 Mârgaśîrsha... | 3 Mithuna. | 47 Pramâdin...... | 3 Jyeshṭha...... | 9 Dhanus. |
| 18 Târaṇa........ | 10 Pausha........ | 4 Karka. | 48 Ânanda........ | 4 Âshâḍha....... | 10 Makara. |
| 19 Pârthiva...... | 11 Mâgha......... | 5 Siṁha. | 49 Râkshasa...... | 5 Śrâvaṇa....... | 11 Kumbha. |
| 20 Vyaya......... | 12 Phâlguna...... | 6 Kanyâ. | 50 Anala......... | 6 Bhâdrapada.... | 12 Mîna. |
| 21 Sarvajit...... | 1 Chaitra....... | 7 Tulâ. | 51 Piṅgala....... | 7 Âśvina........ | 1 Mesha. |
| 22 Sarvadhârin... | 2 Vaiśâkha...... | 8 Vṛiśchika. | 52 Kâlayukta..... | 8 Kârttika...... | 2 Vrishabha. |
| 23 Virodhin...... | 3 Jyeshṭha...... | 9 Dhanus. | 53 Siddhârtin..... | 9 Mârgaśîrsha... | 3 Mithuna. |
| 24 Vikṛita....... | 4 Âshâḍha....... | 10 Makara. | 54 Raudra........ | 10 Pausha........ | 4 Karka. |
| 25 Khara......... | 5 Śrâvaṇa....... | 11 Kumbha. | 55 Durmati....... | 11 Mâgha........ | 5 Siṁha. |
| 26 Nandana....... | 6 Bhâdrapada.... | 12 Mîna. | 56 Dundubhi...... | 12 Phâlguna...... | 6 Kanyâ. |
| 27 Vijaya........ | 7 Âśvina........ | 1 Mesha. | 57 Rudhirodgârin.. | 1 Chaitra....... | 7 Tulâ. |
| 28 Jaya.......... | 8 Kârttika...... | 2 Vrishabha. | 58 Raktâksha..... | 2 Vaiśâkha...... | 8 Vṛiśchika. |
| 29 Manmatha...... | 9 Mârgaśîrsha... | 3 Mithuna. | 59 Krodhana...... | 3 Jyeshṭha...... | 9 Dhanus. |
| 30 Durmukha...... | 10 Pausha........ | 4 Karka. | 60 Kshaya........ | 4 Âshâḍha....... | 10 Makara. |

N.B. i. The samvatsara and sign (cols. 2, 3) correspond to the samvatsara in col. 1 only when the latter is taken as the samvatsara of the *mean-sign* (Northern) 60-year cycle (Table I., col. 7).

N.B. ii. Jupiter's sign by his apparent longitude is either the same, as or the next preceding, or the next succeeding his mean-sign. Thus, in Prabhava Jupiter stands in mean Kumbha, when he may have been either in apparent Makara, Kumbha, or Mîna.

# TABLE XIII.

*(The following Table for finding the day of the week for any date from A.D. 300 to 2300 has been supplied by Dr. Burgess.)*

CALENDAR FOR THE YEARS FROM A.D. 300 TO 2300.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Old Style. | 300<br>1000<br>1700 | 400<br>1100<br>1800 | 500<br>1200<br>— | 600<br>1300<br>— | 700<br>1400<br>— | 800<br>1500<br>— | 900<br>1600<br>— |
| Odd Years of the Centuries | | | | New Style. | —<br>—<br>— | 1500<br>1900<br>G * | 1600<br>2000<br>— | —<br>—<br>— | 1700<br>2100<br>C | —<br>—<br>— | 1800<br>2200<br>E |
| 0 | 28 | 56 | 84 | | GF | AG | BA | CB | DC | ED | FE |
| 1 | 29 | 57 | 85 | | E | F | G | A | B | C | D |
| 2 | 30 | 58 | 86 | | D | E | F | G | A | B | C |
| 3 | 31 | 59 | 87 | | C | D | E | F | G | A | B |
| 4 | 32 | 60 | 88 | | BA | CB | DC | ED | FE | GF | AG |
| 5 | 33 | 61 | 89 | | G | A | B | C | D | E | F |
| 6 | 34 | 62 | 90 | | F | G | A | B | C | D | E |
| 7 | 35 | 63 | 91 | | E | F | G | A | B | C | D |
| 8 | 36 | 64 | 92 | | DC | ED | FE | GF | AG | BA | CB |
| 9 | 37 | 65 | 93 | | B | C | D | E | F | G | A |
| 10 | 38 | 66 | 94 | | A | B | C | D | E | F | G |
| 11 | 39 | 67 | 95 | | G | A | B | C | D | E | F |
| 12 | 40 | 68 | 96 | | FE | GF | AG | BA | CB | DC | ED |
| 13 | 41 | 69 | 97 | | D | E | F | G | A | B | C |
| 14 | 42 | 70 | 98 | | C | D | E | F | G | A | B |
| 15 | 43 | 71 | 99 | | B | C | D | E | F | G | A |
| 16 | 44 | 72 | — | | AG | BA | CB | DC | ED | FE | GF |
| 17 | 45 | 73 | — | | F | G | A | B | C | D | E |
| 18 | 46 | 74 | — | | E | F | G | A | B | C | D |
| 19 | 47 | 75 | — | | D | E | F | G | A | B | C |
| 20 | 48 | 76 | — | | CB | DC | ED | FE | GF | AG | BA |
| 21 | 49 | 77 | — | | A | B | C | D | E | F | G |
| 22 | 50 | 78 | — | | G | A | B | C | D | E | F |
| 23 | 51 | 79 | — | | F | G | A | B | C | D | E |
| 24 | 52 | 80 | — | | ED | FE | GF | AG | BA | CB | DC |
| 25 | 53 | 81 | — | | C | D | E | F | G | A | B |
| 26 | 54 | 82 | — | | B | C | D | E | F | G | A |
| 27 | 55 | 83 | — | | A | B | C | D | E | F | G |

* For the years 1500, 1700, &c. (N.S.) which are not leap years, the Dominical letters are given in this line.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| January | | | October | | A | G | F | E | D | C | B |
| February, March | | | November | | D | C | B | A | G | F | E |
| April | | | July | | G | F | E | D | C | B | A |
| May | | | | | B | A | G | F | E | D | C |
| June | | | | | E | D | C | B | A | G | F |
| August | | | | | C | B | A | G | F | E | D |
| September | | | December | | F | E | D | C | B | A | G |
| 1 | 8 | 15 | 22 | 29 | 1 Sun. | 2 Mon. | 3 Tues. | 4 Wed. | 5 Thur. | 6 Fri. | 0 Sat. |
| 2 | 9 | 16 | 23 | 30 | 2 Mon. | 3 Tues. | 4 Wed. | 5 Thur. | 6 Fri. | 0 Sat. | 1 Sun. |
| 3 | 10 | 17 | 24 | 31 | 3 Tues. | 4 Wed. | 5 Thur. | 6 Fri. | 0 Sat. | 1 Sun. | 2 Mon. |
| 4 | 11 | 18 | 25 | — | 4 Wed. | 5 Thur. | 6 Fri. | 0 Sat. | 1 Sun. | 2 Mon. | 3 Tues. |
| 5 | 12 | 19 | 26 | — | 5 Thur. | 6 Fri. | 0 Sat. | 1 Sun. | 2 Mon. | 3 Tues. | 4 Wed. |
| 6 | 13 | 20 | 27 | — | 6 Fri. | 0 Sat. | 1 Sun. | 2 Mon. | 3 Tues. | 4 Wed. | 5 Thur. |
| 7 | 14 | 21 | 28 | — | 0 Sat. | 1 Sun. | 2 Mon. | 3 Tues. | 4 Wed. | 5 Thur. | 6 Fri. |

Look out for the century in the head of the Table, and the odd years in the left hand columns: and in the corresponding column and line is the Dominical letter. Thus for 1893 N.S. the Dominical letter is found to be A.

In the 2nd Table find the month, and in line with it the same Dominical letter, in the same column with which are the days of the week corresponding to the days of the month on the left. Thus, for July 1893, we find, in line with July A in the last column; and in the column below Saturday corresponds to the 1st, 8th, 15th, &c. of the month, Sunday to 2nd, 9th, &c.

When there are two letters together it is a leap year and the first letter serves for January and February, the second for the rest of the year. Thus, for A.D. 600, the Dominical letters are CB, and 29th February is found with C to be Monday 1st March is found with B to be Tuesday.

# TABLE XI[illegible]

FOR CONVERSION OF A HINDU SOLAR DATE INTO THE CO[illegible] A.D. AND VICE VERSÂ

*[This Table is dangerous to use unless all the items of calculation of the Hindu Date are known. When they are known, let it be borne in mind that the result, as found from the Table, though [illegible] wrong by one day, occasionally by two days. This variation is unavoidable in an eye-table. Where absolute correctness is required, proceed by Art. 149.]*

| MESHÂDI YEARS. (Beginning with Mesha or Vaiśâkha (Baiśâkh) Sittirai (Tam.)) | 1. MESHA, VAIŚÂKHA SITTIRAI (Tam.) | 2. Vrishabha, Jyeshṭha Vaigâsi (Tam.) | 3. Mithuna, Âshâḍha Âni (Tam.) | 4. Karka, Śrâvaṇa Âḍi (Tam.) | 5. Siṁha, Bhâdrapada Âvaṇi (Tam.) | 6. Kanyâ, Puraṭṭâśi [illegible] | 7. Tulâ, Kârttika Aippasi (Tam.) | 8. Vṛiśchika, Mârgaśîrsha, Kârttigai (Tam.) | 9. Dhanus, Pausha Mârgaḷi (Tam.) | 10. Makara, Mâgha Tai (Tam.) | 11. Kumbha, Phâlguna Mâśi (Tam.) | 12. Mîna, Chaitra Panguni (Tam.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SIMHÂDI YEARS. (Beginning with Siṁha, Chingam or Âvaṇi (Tinnevelly & South Malayâḷa)) | 9. *Medam, Sittirai.* | 10. *Edavam, Vaigâsi.* | 11. *Midunam, Âni.* | 12. *Karkaḍakam, Âḍi.* | 1. CHINGAM, ÂVAṆI | 2. Kanni, [illegible] | 3. Tulâm, Aippasi | 4. Vṛiśchikam, Kârttigai. | 5. Dhanu, Mârgaḷi. | 6. Makaram, Tai. | 7. Kumbham, Mâśi. | 8. Mînam, Panguni. |
| KANYÂDI YEARS. (Beginning with Kanyâ, Kanni (North Malayâḷa), or Âsvin (S. W. India)) | 8. *Medam.* | 9. *Edavam.* | 10. *Midunam.* | 11. *Karkaḍakam.* | 12. *Chingam.* | 1. KAN[illegible] | 2. Tulâm. | 3. Vṛiśchikam. | 4. Dhanu. | 5. Makaram. | 6. Kumbham. | 7. Mînam. |

*Ferial numbers found from Table I.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 0 |
|---|---|---|---|---|---|---|---|
| (1) | Sun. | Mon. | Tues. | Wed. | Thur. | Fri. | Sat. |
| (2) | Mon. | Tues. | Wed. | Thur. | Fri. | Sat. | Sun. |
| (3) | Tues. | Wed. | Thur. | Fri. | Sat. | Sun. | Mon. |
| (4) | Wed. | Thur. | Fri. | Sat. | Sun. | Mon. | Tues. |
| (5) | Thur. | Fri. | Sat. | Sun. | Mon. | Tues. | Wed. |
| (6) | Fri. | Sat. | Sun. | Mon. | Tues. | Wed. | Thur. |
| (7) | Sat. | Sun. | Mon. | Tues. | Wed. | Thur. | Fri. |

Days of the solar month (Mesha and Vṛishabha):

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 8 | 15 | 22 | 29 | — | 5 | 12 | 19 | 26 |
| 2 | 9 | 16 | 23 | 30 | — | 6 | 13 | 20 | 27 |
| 3 | 10 | 17 | 24 | 31 | — | 7 | 14 | 21 | 28 |
| 4 | 11 | 18 | 25 | — | 1 | 8 | 15 | 22 | 29 |
| 5 | 12 | 19 | 26 | — | 2 | 9 | 16 | 23 | 30 |
| 6 | 13 | 20 | 27 | — | 3 | 10 | 17 | 24 | 31 |
| 7 | 14 | 21 | 28 | — | 4 | 11 | 18 | 25 | — |

Remaining day-number columns (months 3–12): [illegible]

| (1) | (2) | (3) | (4) | (5) | (6) | (7) | Mesha | | | | | Vṛishabha | | | | | Remaining months |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mar. 13 | Mar. — | Mar. — | Mar. — | Mar. — | Mar. — | Mar. — | Mar. 13 | Mar. 20 | Mar. 27 | Apr. 3 | Apr. 10 | Apr. 10 | Apr. 17 | Apr. 24 | May 1 | May 8 | [illegible] |
| 14 | 13 | — | — | — | — | — | 14 | 21 | 28 | 4 | 11 | 11 | 18 | 25 | 2 | 9 | [illegible] |
| [illegible] | | | | | | | | | | | | | | | | | |

# TABLE XV.

FOR CONVERSION OF A HINDU LUNI-SOLAR DATE INTO THE CORRESPONDING DATE A.D. AND VICE-VERSÂ.

*[It is not safe to use this Table unless all the bases of calculation of the given Hindu Date are known. When they are known, let it be borne in mind that the result, as found from this Table, though often correct, is often wrong by one day, occasionally by two days. This variation is unavoidable in [illegible] [illegible]. Where absolute correctness is required, proceed by Art. 139.]*

| Amânta months of Chaitrâdi years beginning with Chaitra Śukla (Mahâḍḍa Tel. Can.), or Paggu (Tulu.) | 1. Chaitra (Tel. Can.) 1. Paggu (Tulu.) | 2. Vaiśâkha (Tel. Can.) 2. Besâ (Tulu.) | 3. Jyeshṭha (Tel. Can.) 3. Kârtelu (Tulu.) | 4. Âshâḍha (Tel. Can.) 4. Âṭi (Tulu.) | 5. Śrâvaṇa (Tel. Can.) 5. Sôna (Tulu.) | 6. Bhâdrapada (Tel. Can.) 6. Nirnâla (Tulu.) | 7. Âśvina (Tel. Can.) 7. Bonteḷu (Tulu.) | 8. Kârttika (Tel. Can.) 8. Jârde (Tulu.) | 9. Mârgaśîrsha (Tel. Can.) 9. Perârde (Tulu.) | 10. Pausha (Tel. Can.) 10. Pûntelu (Tulu.) | 11. Mâgha (Tel. Can.) 11. Mâyi (Tulu.) | 12. Phâlguna (Tel. Can.) 12. Suggi (Tulu.) | 13th Month in intercalary years. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pûrṇimânta months of Chaitrâdi years beginning with Chaitra Śukla (Chaitrâdi Vikrama) (Beng. Samvat.) | 1. Chaitra śukla. / 2. Vaiśâkha kṛishṇa. | 2. Vaiśâkha śukla. / 3. Jyeshṭha kṛishṇa. | 3. Jyeshṭha śukla. / 4. Âshâḍha kṛishṇa. | 4. Âshâḍha śukla. / 5. Śrâvaṇa kṛishṇa. | 5. Śrâvaṇa śukla. / 6. Bhâdrapada kṛishṇa. | 6. Bhâdrapada śukla. / 7. Âśvina kṛishṇa. | 7. Âśvina śukla. / 8. Kârttika kṛishṇa. | 8. Kârttika śukla. / 9. Mârgaśîrsha kṛishṇa. | 9. Mârgaśîrsha śukla. / 10. [Pau]sha kṛishṇa. | 10. Pausha śukla. / 11. Mâgha kṛishṇa. | 11. Mâgha śukla. / 12. Phâlguna kṛishṇa. | 12. Phâlguna śukla. / 1. Chaitra kṛishṇa. | |
| Amânta months of Kârttikâdi years beginning with Kârttika Śukla (S. Vikrama. Nevâr.) | 6. *Chaitra* (S. Vikrama. Nevâr.) | 7. *Vaiśâkha* (S. Vikrama. Nevâr.) | 8. *Jyeshṭha* (S. Vikrama. Nevâr.) | 9. *Âshâḍha* (S. Vikrama. Nevâr.) | 10. *Śrâvaṇa* (S. Vikrama. Nevâr.) | 11. *Bhâdrapada* (S. Vikrama. Nevâr.) | 12. *Âśvina* (S. Vikrama. Nevâr.) | 1. Kârttika (S. Vikrama. Nevâr.) | 2. Mârgaśîrsha (S. Vikrama. Nevâr.) | 3. Pausha (S. Vikrama. Nevâr.) | 5. Mâgha (S. Vikrama. Nevâr.) | 5. Phâlguna (S. Vikrama. Nevâr.) | |
| | Śukla. / Kṛishṇa. | Śukla. / Kṛishṇa. | Śukla. / Kṛishṇa. | Śukla. / Kṛishṇa. | Śukla. / Kṛishṇa. | Śukla. / Kṛishṇa. | Śukla. / Kṛishṇa. | Śukla. / Kṛishṇa. | Śukla. / Kṛishṇa. | Śukla. / Kṛishṇa. | Śukla. / Kṛishṇa. | Śukla. / Kṛishṇa. | Śukla. / Kṛishṇa. |

| | 1 | 2 | 3 | 4 | 5 | 6 | 0 | Chaitra Śu. | | Kṛ. | | | Vaiśâkha Śu. | | Kṛ. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) | Sun. | Mon. | Tues. | Wed. | Thur. | Fri. | Sat. | Su. 1 | 8 | 15 | 7 | 14 | — | 6 | 13 | 5 | 12 |
| (2) | Mon. | Tues. | Wed. | Thur. | Fri. | Sat. | Sun. | 2 | 9 | Kr. 1 | 8 | 30 | — | 7 | 14 | 6 | 13 |
| (3) | Tues. | Wed. | Thur. | Fri. | Sat. | Sun. | Mon. | 3 | 10 | 2 | 9 | — | Su. 1 | 8 | 15 | 7 | 14 or 30 |
| (4) | Wed. | Thur. | Fri. | Sat. | Sun. | Mon. | Tues. | 4 | 11 | 3 | 10 | — | 2 | 9 | Kr. 1 | 8 | — |
| (5) | Thur. | Fri. | Sat. | Sun. | Mon. | Tues. | Wed. | 5 | 12 | 4 | 11 | — | 3 | 10 | 2 | 9 | — |
| (6) | Fri. | Sat. | Sun. | Mon. | Tues. | Wed. | Thur. | 6 | 13 | 5 | 12 | — | 4 | 11 | 3 | 10 | — |
| (7) | Sat. | Sun. | Mon. | Tues. | Wed. | Thur. | Fri. | 7 | 14 | 6 | 13 | — | 5 | 12 | 4 | 11 | — |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | | | | | | | | | | |
| | Feb. 16 | Feb. 15 | Feb. 14 | Feb. 13 | Feb. 12 | — | — | Feb. 16 | Feb. 23 | Mar. 2 | Mar. 9 | Mar. 16 | Mar. 16 | Mar. 23 | Mar. 30 | Apr. 6 | Apr. 13 |
| | 17 | 16 | 15 | 14 | 13 | Feb. 12 | — | 17 | 24 | 3 | 10 | 17 | 17 | 24 | 31 | 7 | 14 |
| | 18 | 17 | 16 | 15 | 14 | 13 | Feb. 12 | 18 | 25 | 4 | 11 | 18 | 18 | 25 | Apr. 1 | 8 | 15 |
| | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 19 | 26 | 5 | 12 | 19 | 19 | 26 | 2 | 9 | 16 |
| | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 20 | 27 | 6 | 13 | 20 | 20 | 27 | 3 | 10 | 17 |
| | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

[illegible]

# TABLE XV. (CONTINUED.)

## FOR CONVERSION OF A HINDU LUNI-SOLAR DATE INTO THE CORRESPONDING DATE A.D. AND VICE-VERSÂ.

*[It is not safe to use this Table unless all the bases of calculation of the given Hindu Date are known. When they are known, let it be borne in mind that the result, as found from this Table, though often correct, is often wrong by one day, occasionally by two days. This variation is unavoidable in an eye-table. Where absolute correctness is required, proceed by Art. 139.]*

| AMÂNTA MONTHS OF CHAITRÂDI YEARS beginning with Chaitra Śukla (Mahrâṭhî, Tel. Can.), or Paggu (Tulu.) | PÛRṆIMÂNTA MONTHS OF CHAITRÂDI YEARS beginning with Chaitra Śukla (Chaitrâdi Vikrama) (Beng. Samvat.) | AMÂNTA MONTHS OF KÂRTTIKÂDI YEARS beginning with Kârttika Śukla (S. Vikrama. Nevâr.) |
|---|---|---|
| 1. Chaitra (Tel. Can.) 1. Paggu (Tulu.) | 1. Chaitra śukla. / 2. Vaiśâkha kṛishṇa. | 6. Chaitra (S. Vikrama. Nevâr.) |
| 2. Vaiśâkha (Tel. Can.) 2. Besâ (Tulu.) | 2. Vaiśâkha śukla. / 3. Jyeshṭha kṛishṇa. | 7. Vaiśâkha (S. Vikrama. Nevâr.) |
| 3. Jyeshṭha (Tel. Can.) 3. Kârtelu (Tulu.) | 3. Jyeshṭha śukla. / 4. Âshâḍha kṛishṇa. | 8. Jyeshṭha (S. Vikrama. Nevâr.) |
| 4. Âshâḍha (Tel. Can.) 4. Âṭi (Tulu.) | 4. Âshâḍha śukla. / 5. Śrâvaṇa kṛishṇa. | 9. Âshâḍha (S. Vikrama. Nevâr.) |
| 5. Śrâvaṇa (Tel. Can.) 5. Sôna (Tulu.) | 5. Śrâvaṇa śukla. / 6. Bhâdrapada kṛishṇa. | 10. Śrâvaṇa (S. Vikrama. Nevâr.) |
| 6. Bhâdrapada (Tel. Can.) 6. Nirnâla (Tulu.) | 6. Bhâdrapada śukla. / 7. Âśvina kṛishṇa. | 11. Bhâdrapada (S. Vikrama. Nevâr.) |
| 7. Âśvina (Tel. Can.) 7. Bontelu (Tulu.) | 7. Âśvina śukla. / 8. Kârttika kṛishṇa. | 12. Âśvina (S. Vikrama. Nevâr.) |
| 8. Kârttika (Tel. Can.) 8. Jârde (Tulu.) | 8. Kârttika śukla. / 9. Mârgaśîrsha kṛishṇa. | 1. Kârttika (S. Vikrama. Nevâr.) |
| 9. Mârgaśîrsha (Tel. Can.) 9. Perârde (Tulu.) | 9. Mârgaśîrsha śukla. / 10. Pausha kṛishṇa. | 2. Mârgaśîrsha (S. Vikrama. Nevâr.) |
| 10. Pausha (Tel. Can.) 10. Pûntelu (Tulu.) | 10. Pausha śukla. / 11. Mâgha kṛishṇa. | 3. Pausha (S. Vikrama. Nevâr.) |
| 11. Mâgha (Tel. Can.) 11. Mâyi (Tulu.) | 11. Mâgha śukla. / 12. Phâlguna kṛishṇa. | 4. Mâgha (S. Vikrama. Nevâr.) |
| 12. Phâlguna (Tel. Can.) 12. Suggi (Tulu.) | 12. Phâlguna śukla. / 1. Chaitra kṛishṇa. | 5. Phâlguna (S. Vikrama. Nevâr.) |
| 13th Month in intercalary years. | | |

Weekdays:

| | 1 | 2 | 3 | 4 | 5 | 6 | 0 |
|---|---|---|---|---|---|---|---|
| (1) | Sun. | Mon. | Tues. | Wed. | Thur. | Fri. | Sat. |
| (2) | Mon. | Tues. | Wed. | Thur. | Fri. | Sat. | Sun. |
| (3) | Tues. | Wed. | Thur. | Fri. | Sat. | Sun. | Mon. |
| (4) | Wed. | Thur. | Fri. | Sat. | Sun. | Mon. | Tues. |
| (5) | Thur. | Fri. | Sat. | Sun. | Mon. | Tues. | Wed. |
| (6) | Fri. | Sat. | Sun. | Mon. | Tues. | Wed. | Thur. |
| (7) | Sat. | Sun. | Mon. | Tues. | Wed. | Thur. | Fri. |

Tithis (months 1–4):

| | 1. Śukla | | | 1. Kṛishṇa | | 2. Śukla | | | 2. Kṛishṇa | | 3. Śukla | | | 3. Kṛishṇa | | 4. Śukla | | | 4. Kṛishṇa | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) | Su. 1 | 8 | 15 | 7 | 14 | — | 6 | 13 | 5 | 12 | — | 5 | 12 | 4 | 11 | — | 3 | 10 | 2 | 9 |
| (2) | 2 | 9 | Kr. 1 | 8 | 30 | — | 7 | 14 | 6 | 13 | — | 6 | 13 | 5 | 12 | — | 4 | 11 | 3 | 10 |
| (3) | 3 | 10 | 2 | 9 | — | Su. 1 | 8 | 15 | 7 | 14 or 30 | — | 7 | 14 | 6 | 13 | — | 5 | 12 | 4 | 11 |
| (4) | 4 | 11 | 3 | 10 | — | 2 | 9 | Kr. 1 | 8 | — | Su. 1 | 8 | 15 | 7 | 14 | — | 6 | 13 | 5 | 12 |
| (5) | 5 | 12 | 4 | 11 | — | 3 | 10 | 2 | 9 | — | 2 | 9 | Kr. 1 | 8 | 30 | — | 7 | 14 | 6 | 13 |
| (6) | 6 | 13 | 5 | 12 | — | 4 | 11 | 3 | 10 | — | 3 | 10 | 2 | 9 | — | Su. 1 | 8 | 15 | 7 | 14 or 30 |
| (7) | 7 | 14 | 6 | 13 | — | 5 | 12 | 4 | 11 | — | 4 | 11 | 3 | 10 | — | 2 | 9 | Kr. 1 | 8 | — |

Tithis (months 5–8):

| | 5. Śukla | | | 5. Kṛishṇa | | | 6. Śukla | | | 6. Kṛishṇa | | 7. Śukla | | | 7. Kṛishṇa | | 8. Śukla | | | 8. Kṛishṇa | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) | — | 2 | 9 | Kr. 1 | 8 | 30 | — | 7 | 14 | 6 | 13 | — | 6 | 13 | 5 | 12 | — | 4 | 11 | 3 | 10 |
| (2) | — | 3 | 10 | 2 | 9 | — | Su. 1 | 8 | 15 | 7 | 14 or 30 | — | 7 | 14 | 6 | 13 | — | 5 | 12 | 4 | 11 |
| (3) | — | 4 | 11 | 3 | 10 | — | 2 | 9 | Kr. 1 | 8 | — | Su. 1 | 8 | 15 | 7 | 14 | — | 6 | 13 | 5 | 12 |
| (4) | — | 5 | 12 | 4 | 11 | — | 3 | 10 | 2 | 9 | — | 2 | 9 | Kr. 1 | 8 | 30 | — | 7 | 14 | 6 | 13 |
| (5) | — | 6 | 13 | 5 | 12 | — | 4 | 11 | 3 | 10 | — | 3 | 10 | 2 | 9 | — | Su. 1 | 8 | 15 | 7 | 14 or 30 |
| (6) | — | 7 | 14 | 6 | 13 | — | 5 | 12 | 4 | 11 | — | 4 | 11 | 3 | 10 | — | 2 | 9 | Kr. 1 | 8 | — |
| (7) | Su. 1 | 8 | 15 | 7 | 14 | — | 6 | 13 | 5 | 12 | — | 5 | 12 | 4 | 11 | — | 3 | 10 | 2 | 9 | — |

Tithis (months 9–12 and 13th month):

| | 9. Śukla | | | 9. Kṛishṇa | | 10. Śukla | | | 10. Kṛishṇa | | 11. Śukla | | | 11. Kṛishṇa | | 12. Śukla | | | 12. Kṛishṇa | | 13th Śukla | | | 13th Kṛishṇa | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) | — | 3 | 10 | 2 | 9 | Su. 1 | 8 | 15 | 7 | 14 or 30 | — | 7 | 14 | 6 | 13 | — | 5 | 12 | 4 | 11 | — | 4 | 11 | 3 | 10 |
| (2) | — | 4 | 11 | 3 | 10 | 2 | 9 | Kr. 1 | 8 | — | Su. 1 | 8 | 15 | 7 | 14 | — | 6 | 13 | 5 | 12 | — | 5 | 12 | 4 | 11 |
| (3) | — | 5 | 12 | 4 | 11 | 3 | 10 | 2 | 9 | — | 2 | 9 | Kr. 1 | 8 | 30 | — | 7 | 14 | 6 | 13 | — | 6 | 13 | 5 | 12 |
| (4) | — | 6 | 13 | 5 | 12 | 4 | 11 | 3 | 10 | — | 3 | 10 | 2 | 9 | — | Su. 1 | 8 | 15 | 7 | 14 or 30 | — | 7 | 14 | 6 | 13 |
| (5) | — | 7 | 14 | 6 | 13 | 5 | 12 | 4 | 11 | — | 4 | 11 | 3 | 10 | — | 2 | 9 | Kr. 1 | 8 | — | Su. 1 | 8 | 15 | 7 | 14 |
| (6) | Su. 1 | 8 | 15 | 7 | 14 | 6 | 13 | 5 | 12 | — | 5 | 12 | 4 | 11 | — | 3 | 10 | 2 | 9 | — | 2 | 9 | Kr. 1 | 8 | 30 |
| (7) | 2 | 9 | Kr. 1 | 8 | 30 | 7 | 14 | 6 | 13 | — | 6 | 13 | 5 | 12 | — | 4 | 11 | 3 | 10 | — | 3 | 10 | 2 | 9 | — |

First row of the date block (the dates of the weeks under each column):

| (1)–(7) | Month 1 | | | | | Month 2 | | | | | Month 3 | | | | | Month 4 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mar. 13 | Mar. 13 | Mar. 20 | Mar. 27 | Apr. 3 | Apr. 10 | Apr. 10 | Apr. 17 | Apr. 24 | May 1 | May 8 | May 8 | May 15 | May 22 | May 29 | Jun. 5 | Jun. 5 | Jun. 12 | Jun. 19 | Jun. 26 | Jul. 3 |

| Month 5 | | | | | | Month 6 | | | | | Month 7 | | | | | Month 8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jul. 3 | Jul. 10 | Jul. 17 | Jul. 24 | Jul. 31 | Aug. 7 | Aug. 7 | Aug. 14 | Aug. 21 | Aug. 28 | Sep. 4 | Sep. 4 | Sep. 11 | Sep. 18 | Sep. 25 | Oct. 2 | Oct. 2 | Oct. 9 | Oct. 16 | Oct. 23 | Oct. 30 |

| Month 9 | | | | | Month 10 | | | | | Month 11 | | | | | Month 12 | | | | | 13th | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct. 30 | Nov. 6 | Nov. 13 | Nov. 20 | Nov. 27 | Dec. 4 | Dec. 11 | Dec. 18 | Dec. 25 | Jan. 1 | Jan. 1 | Jan. 8 | Jan. 15 | Jan. 22 | Jan. 29 | Jan. 29 | Feb. 5 | Feb. 12 | Feb. 19 | Feb. 26 | Feb. 26 | Mar. 5 | Mar. 12 | Mar. 19 | Mar. 26 |

[illegible]

# TABLE XVI.

## INITIAL DAYS OF MUHAMMADAN YEARS OF THE HIJRA.

N.B. i. *Asterisks indicate Leap-years.*
ii. *Up to Hijra 1165 inclusive, the A.D. dates are Old Style.*

| Hijra year. | Commencement of the year. Weekday | Commencement of the year. Date A.D. |
|---|---|---|
| 1 | 2 | 3 |
| 1 | 6 Fri. | 16 July 622 (197) |
| *2 | 3 Tues. | 5 July 623 (186) |
| 3 | 1 Sun. | 24 June 624* (176) |
| 4 | 5 Thurs. | 13 June 625 (164) |
| *5 | 2 Mon. | 2 June 626 (153) |
| 6 | 0 Sat. | 23 May 627 (143) |
| *7 | 4 Wed. | 11 May 628* (132) |
| 8 | 2 Mon. | 1 May 629 (121) |
| 9 | 6 Fri. | 20 Apr. 630 (110) |
| *10 | 3 Tues. | 9 Apr. 631 (99) |
| 11 | 1 Sun. | 29 Mar. 632* (89) |
| 12 | 5 Thurs. | 18 Mar. 633 (77) |
| *13 | 2 Mon. | 7 Mar. 634 (66) |
| 14 | 0 Sat. | 25 Feb. 635 (56) |
| 15 | 4 Wed. | 14 Feb. 636* (45) |
| *16 | 1 Sun. | 2 Feb. 637 (33) |
| 17 | 6 Fri. | 23 Jan. 638 (23) |
| *18 | 3 Tues. | 12 Jan. 639 (12) |
| 19 | 1 Sun. | 2 Jan. 640* (2) |
| 20 | 5 Thurs. | 21 Dec. 640* (356) |
| *21 | 2 Mon. | 10 Dec. 641 (344) |
| 22 | 0 Sat. | 30 Nov. 642 (334) |
| 23 | 4 Wed. | 19 Nov. 643 (323) |
| *24 | 1 Sun. | 7 Nov. 644* (312) |
| 25 | 6 Fri. | 28 Oct. 645 (301) |
| *26 | 3 Tues. | 17 Oct. 646 (290) |
| 27 | 1 Sun. | 7 Oct. 647 (280) |
| 28 | 5 Thurs. | 25 Sep. 648* (269) |
| *29 | 2 Mon. | 14 Sep. 649 (257) |
| 30 | 0 Sat. | 4 Sep. 650 (247) |
| 31 | 4 Wed. | 24 Aug. 651 (236) |
| *32 | 1 Sun. | 12 Aug. 652* (225) |
| 33 | 6 Fri. | 2 Aug. 653 (214) |
| 34 | 3 Tues. | 22 July 654 (203) |
| *35 | 0 Sat. | 11 July 655 (192) |
| 36 | 5 Thurs. | 30 June 656* (182) |
| *37 | 2 Mon. | 19 June 657 (170) |
| 38 | 0 Sat. | 9 June 658 (160) |
| 39 | 4 Wed. | 29 May 659 (149) |
| *40 | 1 Sun. | 17 May 660* (138) |
| 41 | 6 Fri. | 7 May 661 (127) |
| 42 | 3 Tues. | 26 Apr. 662 (116) |
| *43 | 0 Sat. | 15 Apr. 663 (105) |
| 44 | 5 Thurs. | 4 Apr. 664* (95) |
| 45 | 2 Mon. | 24 Mar. 665 (83) |
| *46 | 6 Fri. | 13 Mar. 666 (72) |
| 47 | 4 Wed. | 3 Mar. 667 (62) |
| *48 | 1 Sun. | 20 Feb. 668* (51) |
| 49 | 6 Fri. | 9 Feb. 669 (40) |
| 50 | 3 Tues. | 29 Jan. 670 (29) |
| *51 | 0 Sat. | 18 Jan. 671 (18) |
| 52 | 5 Thurs. | 8 Jan. 672* (8) |
| 53 | 2 Mon. | 27 Dec. 672* (362) |
| *54 | 6 Fri. | 16 Dec. 673 (350) |
| 55 | 4 Wed. | 6 Dec. 674 (340) |
| *56 | 1 Sun. | 25 Nov. 675 (329) |
| 57 | 6 Fri. | 14 Nov. 676* (319) |
| 58 | 3 Tues. | 3 Nov. 677 (307) |
| *59 | 0 Sat. | 23 Oct. 678 (296) |
| 60 | 5 Thurs. | 13 Oct. 679 (286) |
| 61 | 2 Mon. | 1 Oct. 680* (275) |
| *62 | 6 Fri. | 20 Sep. 681 (263) |
| 63 | 4 Wed. | 10 Sep. 682 (253) |
| 64 | 1 Sun. | 30 Aug. 683 (242) |
| *65 | 5 Thurs. | 18 Aug. 684* (231) |
| 66 | 3 Tues. | 8 Aug. 685 (220) |
| *67 | 0 Sat. | 28 July 686 (209) |
| 68 | 5 Thurs. | 18 July 687 (199) |
| 69 | 2 Mon. | 6 July 688* (188) |
| *70 | 6 Fri. | 25 June 689 (176) |
| 71 | 4 Wed. | 15 June 690 (166) |
| 72 | 1 Sun. | 4 June 691 (155) |
| *73 | 5 Thurs. | 23 May 692* (144) |
| 74 | 3 Tues. | 13 May 693 (133) |
| 75 | 1 Sun. | 2 May 694 (122) |
| *76 | 4 Wed. | 21 Apr. 695 (111) |
| 77 | 2 Mon. | 10 Apr. 696* (101) |
| *78 | 6 Fri. | 30 Mar. 697 (89) |
| 79 | 4 Wed. | 20 Mar. 698 (79) |
| 80 | 1 Sun. | 9 Mar. 699 (68) |
| *81 | 5 Thurs. | 26 Feb. 700* (57) |
| 82 | 3 Tues. | 15 Feb. 701 (46) |
| 83 | 0 Sat. | 4 Feb. 702 (35) |
| *84 | 4 Wed. | 24 Jan. 703 (24) |
| 85 | 2 Mon. | 14 Jan. 704* (14) |
| *86 | 6 Fri. | 2 Jan. 705 (2) |
| 87 | 4 Wed. | 23 Dec. 705 (357) |
| 88 | 1 Sun. | 12 Dec. 706 (346) |
| *89 | 5 Thurs. | 1 Dec. 707 (335) |
| 90 | 3 Tues. | 20 Nov. 708* (325) |
| 91 | 0 Sat. | 9 Nov. 709 (313) |
| *92 | 4 Wed. | 29 Oct. 710 (302) |
| 93 | 2 Mon. | 19 Oct. 711 (292) |
| 94 | 6 Fri. | 7 Oct. 712* (281) |
| *95 | 3 Tues. | 26 Sep. 713 (269) |
| 96 | 1 Sun. | 16 Sep. 714 (259) |
| *97 | 5 Thurs. | 5 Sep. 715 (248) |
| 98 | 3 Tues. | 25 Aug. 716* (238) |
| 99 | 0 Sat. | 14 Aug. 717 (226) |
| *100 | 4 Wed. | 3 Aug. 718 (215) |
| 101 | 2 Mon. | 24 July 719 (205) |
| 102 | 6 Fri. | 12 July 720* (194) |
| *103 | 3 Tues. | 1 July 721 (182) |
| 104 | 1 Sun. | 21 June 722 (172) |
| 105 | 5 Thurs. | 10 June 723 (161) |
| *106 | 2 Mon. | 29 May 724* (150) |
| 107 | 0 Sat. | 19 May 725 (139) |
| *108 | 4 Wed. | 8 May 726 (128) |
| 109 | 2 Mon. | 28 Apr. 727 (118) |
| 110 | 6 Fri. | 16 Apr. 728* (107) |
| *111 | 3 Tues. | 5 Apr. 729 (95) |

# TABLE XVI. (CONTINUED.)

## INITIAL DAYS OF MUHAMMADAN YEARS OF THE HIJRA

N.B. i. *Asterisks indicate Leap-years.*
ii. *Up to Hijra 1165 inclusive, the A.D. dates are Old Style.*

| Hijra year | Commencement of the year. | | Hijra year. | Commencement of the year. | | Hijra year | Commencement of the year. | |
|---|---|---|---|---|---|---|---|---|
| | Weekday | Date A.D. | | Weekday. | Date A.D. | | Weekday | Date A.D. |
| 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| 112 | 1 Sun. | 26 Mar. 730 (85) | *149 | 1 Sun. | 16 Feb. 766 (47) | 186 | 2 Mon. | 10 Jan. 802 (10) |
| 113 | 5 Thurs. | 15 Mar. 731 (74) | 150 | 6 Fri. | 6 Feb. 767 (37) | *187 | 6 Fri. | 30 Dec. 802 (364) |
| *114 | 2 Mon. | 3 Mar. 732* (63) | 151 | 3 Tues. | 26 Jan. 768* (26) | 188 | 4 Wed. | 20 Dec. 803 (354) |
| 115 | 0 Sat. | 21 Feb. 733 (52) | *152 | 0 Sat. | 14 Jan. 769 (14) | 189 | 1 Sun. | 8 Dec. 804* (343) |
| *116 | 4 Wed. | 10 Feb. 734 (41) | 153 | 5 Thurs. | 4 Jan. 770 (4) | *190 | 5 Thurs. | 27 Nov. 805 (331) |
| 117 | 2 Mon. | 31 Jan. 735 (31) | 154 | 2 Mon. | 24 Dec. 770 (358) | 191 | 3 Tues. | 17 Nov. 806 (321) |
| 118 | 6 Fri. | 20 Jan. 736* (20) | *155 | 6 Fri. | 13 Dec. 771 (347) | 192 | 0 Sat. | 6 Nov. 807 (310) |
| *119 | 3 Tues. | 8 Jan. 737 (8) | 156 | 4 Wed. | 2 Dec. 772* (337) | *193 | 4 Wed. | 25 Oct. 808* (299) |
| 120 | 1 Sun. | 29 Dec. 737 (363) | *157 | 1 Sun. | 21 Nov. 773 (325) | 194 | 2 Mon. | 15 Oct. 809 (288) |
| 121 | 5 Thurs. | 18 Dec. 738 (352) | 158 | 6 Fri. | 11 Nov. 774 (315) | 195 | 6 Fri. | 4 Oct. 810 (277) |
| *122 | 2 Mon. | 7 Dec. 739 (341) | 159 | 3 Tues. | 31 Oct. 775 (304) | *196 | 3 Tues. | 23 Sep. 811 (266) |
| 123 | 0 Sat. | 26 Nov. 740* (331) | *160 | 0 Sat. | 19 Oct. 776* (293) | 197 | 1 Sun. | 12 Sep. 812* (256) |
| 124 | 4 Wed. | 15 Nov. 741 (319) | 161 | 5 Thurs. | 9 Oct. 777 (282) | *198 | 5 Thurs. | 1 Sep. 813 (244) |
| *125 | 1 Sun. | 4 Nov. 742 (308) | 162 | 2 Mon. | 28 Sep. 778 (271) | 199 | 3 Tues. | 22 Aug. 814 (234) |
| 126 | 6 Fri. | 25 Oct. 743 (298) | *163 | 6 Fri. | 17 Sep. 779 (260) | 200 | 0 Sat. | 11 Aug. 815 (223) |
| *127 | 3 Tues. | 13 Oct. 744* (287) | 164 | 4 Wed. | 6 Sep. 780* (250) | *201 | 4 Wed. | 30 July 816* (212) |
| 128 | 1 Sun. | 3 Oct. 745 (276) | 165 | 1 Sun. | 26 Aug. 781 (238) | 202 | 2 Mon. | 20 July 817 (201) |
| 129 | 5 Thurs. | 22 Sep. 746 (265) | *166 | 5 Thurs. | 15 Aug. 782 (227) | 203 | 6 Fri. | 9 July 818 (190) |
| *130 | 2 Mon. | 11 Sep. 747 (254) | 167 | 3 Tues. | 5 Aug. 783 (217) | *204 | 3 Tues. | 28 June 819 (179) |
| 131 | 0 Sat. | 31 Aug. 748* (244) | *168 | 0 Sat. | 24 July 784* (206) | 205 | 1 Sun. | 17 June 820* (169) |
| 132 | 4 Wed. | 20 Aug. 749 (232) | 169 | 5 Thurs. | 14 July 785 (195) | *206 | 5 Thurs. | 6 June 821 (157) |
| *133 | 1 Sun. | 9 Aug. 750 (221) | 170 | 2 Mon. | 3 July 786 (184) | 207 | 3 Tues. | 27 May 822 (147) |
| 134 | 6 Fri. | 30 July 751 (211) | *171 | 6 Fri. | 22 June 787 (173) | 208 | 0 Sat. | 16 May 823 (136) |
| 135 | 3 Tues. | 18 July 752* (200) | 172 | 4 Wed. | 11 June 788* (163) | *209 | 4 Wed. | 4 May 824* (125) |
| *136 | 0 Sat. | 7 July 753 (188) | 173 | 1 Sun. | 31 May 789 (151) | 210 | 2 Mon. | 24 Apr. 825 (114) |
| 137 | 5 Thurs. | 27 June 754 (178) | *174 | 5 Thurs. | 20 May 790 (140) | 211 | 6 Fri. | 13 Apr. 826 (103) |
| *138 | 2 Mon. | 16 June 755 (167) | 175 | 3 Tues. | 10 May 791 (130) | *212 | 3 Tues. | 2 Apr. 827 (92) |
| 139 | 0 Sat. | 5 June 756* (157) | *176 | 0 Sat. | 28 Apr. 792* (119) | 213 | 1 Sun. | 22 Mar. 828* (82) |
| 140 | 4 Wed. | 25 May 757 (145) | 177 | 5 Thurs. | 18 Apr. 793 (108) | 214 | 5 Thurs. | 11 Mar. 829 (70) |
| *141 | 1 Sun. | 14 May 758 (134) | 178 | 2 Mon. | 7 Apr. 794 (97) | *215 | 2 Mon. | 28 Feb. 830 (59) |
| 142 | 6 Fri. | 4 May 759 (124) | *179 | 6 Fri. | 27 Mar. 795 (86) | 216 | 0 Sat. | 18 Feb. 831 (49) |
| 143 | 3 Tues. | 22 Apr. 760* (113) | 180 | 4 Wed. | 16 Mar. 796* (76) | *217 | 4 Wed. | 7 Feb. 832* (38) |
| *144 | 0 Sat. | 11 Apr. 761 (101) | 181 | 1 Sun. | 5 Mar. 797 (64) | 218 | 2 Mon. | 27 Jan. 833 (27) |
| 145 | 5 Thurs. | 1 Apr. 762 (91) | *182 | 5 Thurs. | 22 Feb. 798 (53) | 219 | 6 Fri. | 16 Jan. 834 (16) |
| *146 | 2 Mon. | 21 Mar. 763 (80) | 183 | 3 Tues. | 12 Feb. 799 (43) | *220 | 3 Tues. | 5 Jan. 835 (5) |
| 147 | 0 Sat. | 10 Mar. 764* (70) | 184 | 0 Sat. | 1 Feb. 800* (32) | 221 | 1 Sun. | 26 Dec. 835 (360) |
| 148 | 4 Wed. | 27 Feb. 765 (58) | *185 | 4 Wed. | 20 Jan. 801 (20) | 222 | 5 Thurs. | 14 Dec. 836* (349) |

# TABLE XVI. (CONTINUED.)

## INITIAL DAYS OF MUHAMMADAN YEARS OF THE HIJRA.

N.B. i. *Asterisks indicate Leap-years.*
ii. *Up to Hijra 1165 inclusive, the A.D. dates are Old Style.*

| Hijra year | Commencement of the year | | Hijra year | Commencement of the year | | Hijra year | Commencement of the year | |
|---|---|---|---|---|---|---|---|---|
| | Weekday. | Date A.D. | | Weekday | Date A.D. | | Weekday. | Date A.D. |
| 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| *223 | 2 Mon. | 3 Dec. 837 (337) | 260 | 3 Tues. | 27 Oct. 873 (300) | 297 | 4 Wed. | 20 Sep. 909 (263) |
| 224 | 0 Sat. | 23 Nov. 838 (327) | *261 | 0 Sat. | 16 Oct. 874 (289) | 298 | 1 Sun. | 9 Sep. 910 (252) |
| 225 | 4 Wed. | 12 Nov. 839 (316) | 262 | 5 Thurs. | 6 Oct. 875 (279) | *299 | 5 Thurs. | 29 Aug. 911 (241) |
| *226 | 1 Sun. | 31 Oct. 840* (305) | 263 | 2 Mon. | 24 Sep. 876* (268) | 300 | 3 Tues. | 18 Aug. 912* (231) |
| 227 | 6 Fri. | 21 Oct. 841 (294) | *264 | 6 Fri. | 13 Sep. 877 (256) | 301 | 0 Sat. | 7 Aug. 913 (219) |
| *228 | 3 Tues. | 10 Oct. 842 (283) | 265 | 4 Wed. | 3 Sep. 878 (246) | *302 | 4 Wed. | 27 July 914 (208) |
| 229 | 1 Sun. | 30 Sep. 843 (273) | *266 | 1 Sun. | 23 Aug. 879 (235) | 303 | 2 Mon. | 17 July 915 (198) |
| 230 | 5 Thurs. | 18 Sep. 844* (262) | 267 | 6 Fri. | 12 Aug. 880* (225) | 304 | 6 Fri. | 5 July 916* (187) |
| *231 | 2 Mon. | 7 Sep. 845 (250) | 268 | 3 Tues. | 1 Aug. 881 (213) | *305 | 3 Tues. | 24 June 917 (175) |
| 232 | 0 Sat. | 28 Aug. 846 (240) | *269 | 0 Sat. | 21 July 882 (202) | 306 | 1 Sun. | 14 June 918 (165) |
| 233 | 4 Wed. | 17 Aug. 847 (229) | 270 | 5 Thurs. | 11 July 883 (192) | *307 | 5 Thurs. | 3 June 919 (154) |
| *234 | 1 Sun. | 5 Aug. 848* (218) | 271 | 2 Mon. | 29 June 884* (181) | 308 | 3 Tues. | 23 May 920* (144) |
| 235 | 6 Fri. | 26 July 849 (207) | *272 | 6 Fri. | 18 June 885 (169) | 309 | 0 Sat. | 12 May 921 (132) |
| *236 | 3 Tues. | 15 July 850 (196) | 273 | 4 Wed. | 8 J[illegible] 886 (159) | *310 | 4 Wed. | 1 May 922 (121) |
| 237 | 1 Sun. | 5 July 851 (186) | 274 | 1 Sun. | 28 May 887 (148) | 311 | 2 Mon. | 21 Apr. 923 (111) |
| 238 | 5 Thurs. | 23 June 852* (175) | *275 | 5 Thurs. | 16 May 888* (137) | 312 | 6 Fri. | 9 Apr. 924* (100) |
| *239 | 2 Mon. | 12 June 853 (163) | 276 | 3 Tues. | 6 May 889 (126) | *313 | 3 Tues. | 29 Mar. 925 (88) |
| 240 | 0 Sat. | 2 June 854 (153) | *277 | 0 Sat. | 25 Apr. 890 (115) | 314 | 1 Sun. | 19 Mar. 926 (78) |
| 241 | 4 Wed. | 22 May 855 (142) | 278 | 5 Thurs. | 15 Apr. 891 (105) | 315 | 5 Thurs. | 8 Mar. 927 (67) |
| *242 | 1 Sun. | 10 May 856* (131) | 279 | 2 Mon. | 3 Apr. 892* (94) | *316 | 2 Mon. | 25 Feb. 928* (56) |
| 243 | 6 Fri. | 30 Apr. 857 (120) | *280 | 6 Fri. | 23 Mar. 893 (82) | 317 | 0 Sat. | 14 Feb. 929 (45) |
| 244 | 3 Tues. | 19 Apr. 858 (109) | 281 | 4 Wed. | 13 Mar. 894 (72) | *318 | 4 Wed. | 3 Feb. 930 (34) |
| *245 | 0 Sat. | 8 Apr. 859 (98) | 282 | 1 Sun. | 2 Mar. 895 (61) | 319 | 2 Mon. | 24 Jan. 931 (24) |
| 246 | 5 Thurs. | 28 Mar. 860* (88) | *283 | 5 Thurs. | 19 Feb. 896* (50) | 320 | 6 Fri. | 13 Jan. 932* (13) |
| *247 | 2 Mon. | 17 Mar. 861 (76) | 284 | 3 Tues. | 8 Feb. 897 (39) | *321 | 3 Tues. | 1 Jan. 933 (1) |
| 248 | 0 Sat. | 7 Mar. 862 (66) | 285 | 0 Sat. | 28 Jan. 898 (28) | 322 | 1 Sun. | 22 Dec. 933 (356) |
| 249 | 4 Wed. | 24 Feb. 863 (55) | *286 | 4 Wed. | 17 Jan. 899 (17) | 323 | 5 Thurs. | 11 Dec. 934 (345) |
| *250 | 1 Sun. | 13 Feb. 864* (44) | 287 | 2 Mon. | 7 Jan. 900* (7) | *324 | 2 Mon. | 30 Nov. 935 (334) |
| 251 | 6 Fri. | 2 Feb. 865 (33) | *288 | 6 Fri. | 26 Dec. 900* (361) | 325 | 0 Sat. | 19 Nov. 936* (324) |
| 252 | 3 Tues. | 22 Jan. 866 (22) | 289 | 4 Wed. | 16 Dec. 901 (350) | *326 | 4 Wed. | 8 Nov. 937 (312) |
| *253 | 0 Sat. | 11 Jan. 867 (11) | 290 | 1 Sun. | 5 Dec. 902 (339) | 327 | 2 Mon. | 29 Oct. 938 (302) |
| 254 | 5 Thurs. | 1 Jan. 868* (1) | *291 | 5 Thurs. | 24 Nov. 903 (328) | 328 | 6 Fri. | 18 Oct. 939 (291) |
| 255 | 3 Mon. | 20 Dec. 868* (355) | 292 | 3 Tues. | 13 Nov. 904* (318) | *329 | 3 Tues. | 6 Oct. 940* (280) |
| *256 | 6 Fri. | 9 Dec. 869 (343) | 293 | 0 Sat. | 2 Nov. 905 (306) | 330 | 1 Sun. | 26 Sep. 941 (269) |
| 257 | 4 Wed. | 29 Nov. 870 (333) | *294 | 4 Wed. | 22 Oct. 906 (295) | 331 | 5 Thurs. | 15 Sep. 942 (258) |
| *258 | 1 Sun. | 18 Nov. 871 (322) | 295 | 2 Mon. | 12 Oct. 907 (285) | *332 | 2 Mon. | 4 Sep. 943 (247) |
| 259 | 6 Fri. | 7 Nov. 872* (312) | *296 | 6 Fri. | 30 Sep. 908* (274) | 333 | 0 Sat. | 24 Aug. 944* (237) |

# TABLE XVI. (CONTINUED.)

## INITIAL DAYS OF MUHAMMADAN YEARS OF THE HIJRA.

N.B. i. *Asterisks indicate Leap-years.*

ii. *Up to Hijra 1165 inclusive, the A.D. dates are Old Style.*

| Hijra year. | Commencement of the year. Weekday | Commencement of the year. Date A.D. | Hijra year. | Commencement of the year. Weekday | Commencement of the year. Date A.D. | Hijra year. | Commencement of the year. Weekday | Commencement of the year. Date A.D. |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| 334 | 4 Wed. | 13 Aug. 945 (225) | 371 | 5 Thurs. | 7 July 981 (188) | *408 | 5 Thurs. | 30 May 1017 (150) |
| *335 | 1 Sun. | 2 Aug. 946 (214) | 372 | 2 Mon. | 26 June 982 (177) | 409 | 3 Tues. | 20 May 1018 (140) |
| 336 | 6 Fri. | 23 July 947 (204) | *373 | 6 Fri. | 15 June 983 (166) | 410 | 0 Sat. | 9 May 1019 (129) |
| *337 | 3 Tues. | 11 July 948* (193) | 374 | 4 Wed. | 4 June 984* (156) | *411 | 4 Wed. | 27 Apr. 1020* (118) |
| 338 | 1 Sun. | 1 July 949 (182) | 375 | 1 Sun. | 24 May 985 (144) | 412 | 2 Mon. | 17 Apr. 1021 (107) |
| 339 | 5 Thurs. | 20 June 950 (171) | *376 | 5 Thurs. | 13 May 986 (133) | 413 | 6 Fri. | 6 Apr. 1022 (96) |
| *340 | 2 Mon. | 9 June 951 (160) | 377 | 3 Tues. | 3 May 987 (123) | *414 | 3 Tues. | 26 Mar. 1023 (85) |
| 341 | 0 Sat. | 29 May 952* (150) | *378 | 0 Sat. | 21 Apr. 988* (112) | 415 | 1 Sun. | 15 Mar. 1024* (75) |
| 342 | 4 Wed. | 18 May 953 (138) | 379 | 5 Thurs. | 11 Apr. 989 (101) | *416 | 5 Thurs. | 4 Mar. 1025 (63) |
| *343 | 1 Sun. | 7 May 954 (127) | 380 | 2 Mon. | 31 Mar. 990 (90) | 417 | 3 Tues. | 22 Feb. 1026 (53) |
| 344 | 6 Fri. | 27 Apr. 955 (117) | *381 | 6 Fri. | 20 Mar. 991 (79) | 418 | 0 Sat. | 11 Feb. 1027 (42) |
| 345 | 3 Tues. | 15 Apr. 956* (106) | 382 | 4 Wed. | 9 Mar. 992* (69) | *419 | 4 Wed. | 31 Jan. 1028* (31) |
| *346 | 0 Sat. | 4 Apr. 957 (94) | 383 | 1 Sun. | 26 Feb. 993 (57) | 420 | 2 Mon. | 20 Jan. 1029 (20) |
| 347 | 5 Thurs. | 25 Mar. 958 (84) | *384 | 5 Thurs. | 15 Feb. 994 (46) | 421 | 6 Fri. | 9 Jan. 1030 (9) |
| *348 | 2 Mon. | 14 Mar. 959 (73) | 385 | 3 Tues. | 5 Feb. 995 (36) | *422 | 3 Tues. | 29 Dec. 1030 (363) |
| 349 | 0 Sat. | 3 Mar. 960* (63) | *386 | 0 Sat. | 25 Jan. 996* (25) | 423 | 1 Sun. | 19 Dec. 1031 (353) |
| 350 | 4 Wed. | 20 Feb. 961 (51) | 387 | 5 Thurs. | 14 Jan. 997 (14) | 424 | 5 Thurs. | 7 Dec. 1032* (342) |
| *351 | 1 Sun. | 9 Feb. 962 (40) | 388 | 2 Mon. | 3 Jan. 998 (3) | *425 | 2 Mon. | 26 Nov. 1033 (330) |
| 352 | 6 Fri. | 30 Jan. 963 (30) | *389 | 6 Fri. | 23 Dec. 998 (357) | 426 | 0 Sat. | 16 Nov. 1034 (320) |
| 353 | 3 Tues. | 19 Jan. 964* (19) | 390 | 4 Wed. | 13 Dec. 999 (347) | *427 | 4 Wed. | 5 Nov. 1035 (309) |
| *354 | 0 Sat. | 7 Jan. 965 (7) | 391 | 1 Sun. | 1 Dec. 1000* (336) | 428 | 2 Mon. | 25 Oct. 1036* (299) |
| 355 | 5 Thurs. | 28 Dec. 965 (362) | *392 | 5 Thurs. | 20 Nov. 1001 (324) | 429 | 6 Fri. | 14 Oct. 1037 (287) |
| *356 | 2 Mon. | 17 Dec. 966 (351) | 393 | 3 Tues. | 10 Nov. 1002 (314) | *430 | 3 Tues. | 3 Oct. 1038 (276) |
| 357 | 0 Sat. | 7 Dec. 967 (341) | 394 | 0 Sat. | 30 Oct. 1003 (303) | 431 | 1 Sun. | 23 Sep. 1039 (266) |
| 358 | 4 Wed. | 25 Nov. 968* (330) | *395 | 4 Wed. | 18 Oct. 1004* (292) | 432 | 5 Thurs. | 11 Sep. 1040* (255) |
| *359 | 1 Sun. | 14 Nov. 969 (318) | 396 | 2 Mon. | 8 Oct. 1005 (281) | *433 | 2 Mon. | 31 Aug. 1041 (243) |
| 360 | 6 Fri. | 4 Nov. 970 (308) | *397 | 6 Fri. | 27 Sep. 1006 (270) | 434 | 0 Sat. | 21 Aug. 1042 (233) |
| 361 | 3 Tues. | 24 Oct. 971 (297) | 398 | 4 Wed. | 17 Sep. 1007 (260) | 435 | 4 Wed. | 10 Aug. 1043 (222) |
| *362 | 0 Sat. | 12 Oct. 972* (286) | 399 | 1 Sun. | 5 Sep. 1008* (249) | *436 | 1 Sun. | 29 July 1044* (211) |
| 363 | 5 Thurs. | 2 Oct. 973 (275) | *400 | 5 Thurs. | 25 Aug. 1009 (237) | 437 | 6 Fri. | 19 July 1045 (200) |
| 364 | 2 Mon. | 21 Sep. 974 (264) | 401 | 3 Tues. | 15 Aug. 1010 (227) | *438 | 3 Tues. | 8 July 1046 (189) |
| *365 | 6 Fri. | 10 Sep. 975 (253) | 402 | 0 Sat. | 4 Aug. 1011 (216) | 439 | 1 Sun. | 28 June 1047 (179) |
| 366 | 4 Wed. | 30 Aug. 976* (243) | *403 | 4 Wed. | 23 July 1012* (205) | 440 | 5 Thurs. | 16 June 1048* (168) |
| *367 | 1 Sun. | 19 Aug. 977 (231) | 404 | 2 Mon. | 13 July 1013 (194) | *441 | 2 Mon. | 5 June 1049 (156) |
| 368 | 6 Fri. | 9 Aug. 978 (221) | 405 | 6 Fri. | 2 July 1014 (183) | 442 | 0 Sat. | 26 May 1050 (146) |
| 369 | 3 Tues. | 29 July 979 (210) | *406 | 3 Tues. | 21 June 1015 (172) | 443 | 4 Wed. | 15 May 1051 (135) |
| *370 | 0 Sat. | 17 July 980* (199) | 407 | 1 Sun. | 10 June 1016* (162) | *444 | 1 Sun. | 3 May 1052* (124) |

# TABLE XVI. (CONTINUED.)

## INITIAL DAYS OF MUHAMMADAN YEARS OF THE HIJRA.

N.B. i. *Asterisks indicate Leap-years.*

ii. *Up to Hijra 1165 inclusive, the A.D. dates are Old Style.*

| Hijra year. | Commencement of the year. | | Hijra year. | Commencement of the year. | | Hijra year. | Commencement of the year. | |
|---|---|---|---|---|---|---|---|---|
| | Weekday. | Date A.D. | | Weekday. | Date A.D. | | Weekday. | Date A.D. |
| 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| 445 | 6 Fri. | 23 Apr. 1053 (113) | *482 | 6 Fri. | 16 Mar. 1089 (75) | 519 | 0 Sat. | 7 Feb. 1125 (38) |
| *446 | 3 Tues. | 12 Apr. 1054 (102) | 483 | 4 Wed. | 6 Mar. 1090 (65) | *520 | 4 Wed. | 27 Jan. 1126 (27) |
| 447 | 1 Sun. | 2 Apr. 1055 (92) | 484 | 1 Sun. | 23 Feb. 1091 (54) | 521 | 2 Mon. | 17 Jan. 1127 (17) |
| 448 | 5 Thurs. | 21 Mar. 1056* (81) | *485 | 5 Thurs. | 12 Feb. 1092* (43) | 522 | 6 Fri. | 6 Jan. 1128* (6) |
| *449 | 2 Mon. | 10 Mar. 1057 (69) | 486 | 3 Tues. | 1 Feb. 1093 (32) | *523 | 3 Tues. | 25 Dec. 1128* (360) |
| 450 | 0 Sat. | 28 Feb. 1058 (59) | *487 | 0 Sat. | 21 Jan. 1094 (21) | 524 | 1 Sun. | 15 Dec. 1129 (349) |
| 451 | 4 Wed. | 17 Feb. 1059 (48) | 488 | 5 Thurs. | 11 Jan. 1095 (11) | 525 | 5 Thurs. | 4 Dec. 1130 (338) |
| *452 | 1 Sun. | 6 Feb. 1060* (37) | 489 | 2 Mon. | 31 Dec. 1095 (365) | *526 | 2 Mon. | 23 Nov. 1131 (327) |
| 453 | 6 Fri. | 26 Jan. 1061 (26) | *490 | 6 Fri. | 19 Dec. 1096* (354) | 527 | 0 Sat. | 12 Nov. 1132* (317) |
| 454 | 3 Tues. | 15 Jan. 1062 (15) | 491 | 4 Wed. | 9 Dec. 1097 (343) | *528 | 4 Wed. | 1 Nov. 1133 (305) |
| *455 | 0 Sat. | 4 Jan. 1063 (4) | 492 | 1 Sun. | 28 Nov. 1098 (332) | 529 | 2 Mon. | 22 Oct. 1134 (295) |
| 456 | 5 Thurs. | 25 Dec. 1063 (359) | *493 | 5 Thurs. | 17 Nov. 1099 (321) | 530 | 6 Fri. | 11 Oct. 1135 (284) |
| *457 | 2 Mon. | 13 Dec. 1064* (348) | 494 | 3 Tues. | 6 Nov. 1100* (311) | *531 | 3 Tues. | 29 Sep. 1136* (273) |
| 458 | 0 Sat. | 3 Dec. 1065 (337) | 495 | 0 Sat. | 26 Oct. 1101 (299) | 532 | 1 Sun. | 19 Sep. 1137 (262) |
| 459 | 4 Wed. | 22 Nov. 1066 (326) | *496 | 4 Wed. | 15 Oct. 1102 (288) | 533 | 5 Thurs. | 8 Sep. 1138 (251) |
| *460 | 1 Sun. | 11 Nov. 1067 (315) | 497 | 2 Mon. | 5 Oct. 1103 (278) | *534 | 2 Mon. | 28 Aug. 1139 (240) |
| 461 | 6 Fri. | 31 Oct. 1068* (305) | *498 | 6 Fri. | 23 Sep. 1104* (267) | 535 | 0 Sat. | 17 Aug. 1140* (230) |
| 462 | 3 Tues. | 20 Oct. 1069 (293) | 499 | 4 Wed. | 13 Sep. 1105 (256) | *536 | 4 Wed. | 6 Aug. 1141 (218) |
| *463 | 0 Sat. | 9 Oct. 1070 (282) | 500 | 1 Sun. | 2 Sep. 1106 (245) | 537 | 2 Mon. | 27 July 1142 (208) |
| 464 | 5 Thurs. | 29 Sep. 1071 (272) | *501 | 5 Thurs. | 22 Aug. 1107 (234) | 538 | 6 Fri. | 16 July 1143 (197) |
| 465 | 3 Mon. | 17 Sep. 1072* (261) | 502 | 3 Tues. | 11 Aug. 1108* (224) | *539 | 3 Tues. | 4 July 1144* (186) |
| *466 | 6 Fri. | 6 Sep. 1073 (249) | 503 | 0 Sat. | 31 July 1109 (212) | 540 | 1 Sun. | 24 June 1145 (175) |
| 467 | 4 Wed. | 27 Aug. 1074 (239) | *504 | 4 Wed. | 20 July 1110 (201) | 541 | 5 Thurs. | 13 June 1146 (164) |
| *468 | 1 Sun. | 16 Aug. 1075 (228) | 505 | 2 Mon. | 10 July 1111 (191) | *542 | 2 Mon. | 2 June 1147 (153) |
| 469 | 6 Fri. | 5 Aug. 1076* (218) | *506 | 6 Fri. | 28 June 1112* (180) | 543 | 0 Sat. | 22 May 1148* (143) |
| 470 | 3 Tues. | 25 July 1077 (206) | 507 | 4 Wed. | 18 June 1113 (169) | 544 | 4 Wed. | 11 May 1149 (131) |
| *471 | 0 Sat. | 14 July 1078 (195) | 508 | 1 Sun. | 7 June 1114 (158) | *545 | 1 Sun. | 30 Apr. 1150 (120) |
| 472 | 5 Thurs. | 4 July 1079 (185) | *509 | 5 Thurs. | 27 May 1115 (147) | 546 | 6 Fri. | 20 Apr. 1151 (110) |
| 473 | 2 Mon. | 22 June 1080* (174) | 510 | 3 Tues. | 16 May 1116 (137) | *547 | 3 Tues. | 8 Apr. 1152* (99) |
| *474 | 6 Fri. | 11 June 1081 (162) | 511 | 0 Sat. | 5 May 1117 (125) | 548 | 1 Sun. | 29 Mar. 1153 (88) |
| 475 | 4 Wed. | 1 June 1082 (152) | *512 | 4 Wed. | 24 Apr. 1118 (114) | 549 | 5 Thurs. | 18 Mar. 1154 (77) |
| *476 | 1 Sun. | 21 May 1083 (141) | 513 | 2 Mon. | 14 Apr. 1119 (104) | *550 | 2 Mon. | 7 Mar. 1155 (66) |
| 477 | 6 Fri. | 10 May 1084* (131) | 514 | 6 Fri. | 2 Apr. 1120* (93) | 551 | 0 Sat. | 25 Feb. 1156* (56) |
| 478 | 3 Tues. | 29 Apr. 1085 (119) | *515 | 3 Tues. | 22 Mar. 1121 (81) | 552 | 4 Wed. | 13 Feb. 1157 (44) |
| *479 | 0 Sat. | 18 Apr. 1086 (108) | 516 | 1 Sun. | 12 Mar. 1122 (71) | *553 | 1 Sun. | 2 Feb. 1158 (33) |
| 480 | 5 Thurs. | 8 Apr. 1087 (98) | *517 | 5 Thurs. | 1 Mar. 1123 (60) | 554 | 6 Fri. | 23 Jan. 1159 (23) |
| 481 | 2 Mon. | 27 Mar. 1088* (87) | 518 | 3 Tues. | 19 Feb. 1124* (50) | 555 | 3 Tues. | 12 Jan. 1160* (12) |

# TABLE XVI. (CONTINUED.)

## INITIAL DAYS OF MUHAMMADAN YEARS OF THE HIJRA.

N.B. i. *Asterisks indicate Leap-years.*
ii. *Up to Hijra 1165 inclusive, the A.D. dates are Old Style.*

| Hijra year. | Commencement of the year. | | Hijra year. | Commencement of the year. | | Hijra year. | Commencement of the year. | |
|---|---|---|---|---|---|---|---|---|
| | Weekday. | Date A.D. | | Weekday. | Date A.D. | | Weekday. | Date A.D. |
| 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| *556 | 0 Sat. | 31 Dec. 1160* (366) | 593 | 1 Sun. | 24 Nov. 1196* (329) | 630 | 2 Mon. | 18 Oct. 1232* (292) |
| 557 | 5 Thurs. | 21 Dec. 1161 (355) | *594 | 5 Thurs. | 13 Nov. 1197 (317) | 631 | 6 Fri. | 7 Oct. 1233 (280) |
| *558 | 2 Mon. | 10 Dec. 1162 (344) | 595 | 3 Tues. | 3 Nov. 1198 (307) | *632 | 3 Tues. | 26 Sep. 1234 (269) |
| 559 | 0 Sat. | 30 Nov. 1163 (334) | *596 | 0 Sat. | 23 Oct. 1199 (296) | 633 | 1 Sun. | 16 Sep. 1235 (259) |
| 560 | 4 Wed. | 18 Nov. 1164* (323) | 597 | 5 Thurs. | 12 Oct. 1200* (286) | 634 | 5 Thurs. | 4 Sep. 1236* (248) |
| *561 | 1 Sun. | 7 Nov. 1165 (311) | 598 | 2 Mon. | 1 Oct. 1201 (274) | *635 | 2 Mon. | 24 Aug. 1237 (236) |
| 562 | 6 Fri. | 28 Oct. 1166 (301) | *599 | 6 Fri. | 20 Sep. 1202 (263) | 636 | 0 Sat. | 14 Aug. 1238 (226) |
| 563 | 3 Tues. | 17 Oct. 1167 (290) | 600 | 4 Wed. | 10 Sep. 1203 (253) | *637 | 4 Wed. | 3 Aug. 1239 (215) |
| *564 | 0 Sat. | 5 Oct. 1168* (279) | 601 | 1 Sun. | 29 Aug. 1204* (242) | 638 | 2 Mon. | 23 July 1240* (205) |
| 565 | 5 Thurs. | 25 Sep. 1169 (268) | *602 | 5 Thurs. | 18 Aug. 1205 (230) | 639 | 6 Fri. | 12 July 1241 (193) |
| *566 | 2 Mon. | 14 Sep. 1170 (257) | 603 | 3 Tues. | 8 Aug. 1206 (220) | *640 | 3 Tues. | 1 July 1242 (182) |
| 567 | 0 Sat. | 4 Sep. 1171 (247) | 604 | 0 Sat. | 28 July 1207 (209) | 641 | 1 Sun. | 21 June 1243 (172) |
| 568 | 4 Wed. | 23 Aug. 1172* (236) | *605 | 4 Wed. | 16 July 1208* (198) | 642 | 5 Thurs. | 9 June 1244* (161) |
| *569 | 1 Sun. | 12 Aug. 1173 (224) | 606 | 2 Mon. | 6 July 1209 (187) | *643 | 2 Mon. | 29 May 1245 (149) |
| 570 | 6 Fri. | 2 Aug. 1174 (214) | *607 | 6 Fri. | 25 June 1210 (176) | 644 | 0 Sat. | 19 May 1246 (139) |
| 571 | 3 Tues. | 22 July 1175 (203) | 608 | 4 Wed. | 15 June 1211 (166) | 645 | 4 Wed. | 8 May 1247 (128) |
| *572 | 0 Sat. | 10 July 1176* (192) | 609 | 1 Sun. | 3 June 1212* (155) | *646 | 1 Sun. | 26 Apr. 1248* (117) |
| 573 | 5 Thurs. | 30 June 1177 (181) | *610 | 5 Thurs. | 23 May 1213 (143) | 647 | 6 Fri. | 16 Apr. 1249 (106) |
| 574 | 2 Mon. | 19 June 1178 (170) | 611 | 3 Tues. | 13 May 1214 (133) | *648 | 3 Tues. | 5 Apr. 1250 (95) |
| *575 | 6 Fri. | 8 June 1179 (159) | 612 | 0 Sat. | 2 May 1215 (122) | 649 | 1 Sun. | 26 Mar. 1251 (85) |
| 576 | 4 Wed. | 28 May 1180* (149) | *613 | 4 Wed. | 20 Apr. 1216* (111) | 650 | 5 Thurs. | 14 Mar. 1252* (74) |
| *577 | 1 Sun. | 17 May 1181 (137) | 614 | 2 Mon. | 10 Apr. 1217 (100) | *651 | 2 Mon. | 3 Mar. 1253 (62) |
| 578 | 6 Fri. | 7 May 1182 (127) | 615 | 6 Fri. | 30 Mar. 1218 (89) | 652 | 0 Sat. | 21 Feb. 1254 (52) |
| 579 | 3 Tues. | 26 Apr. 1183 (116) | *616 | 3 Tues. | 19 Mar. 1219 (78) | 653 | 4 Wed. | 10 Feb. 1255 (41) |
| *580 | 0 Sat. | 14 Apr. 1184* (105) | 617 | 1 Sun. | 8 Mar. 1220* (68) | *654 | 1 Sun. | 30 Jan. 1256* (30) |
| 581 | 5 Thurs. | 4 Apr. 1185 (94) | *618 | 5 Thurs. | 25 Feb. 1221 (56) | 655 | 6 Fri. | 19 Jan. 1257 (19) |
| 582 | 2 Mon. | 24 Mar. 1186 (83) | 619 | 3 Tues. | 15 Feb. 1222 (46) | *656 | 3 Tues. | 8 Jan. 1258 (8) |
| *583 | 6 Fri. | 13 Mar. 1187 (72) | 620 | 0 Sat. | 4 Feb. 1223 (35) | 657 | 1 Sun. | 29 Dec. 1258 (363) |
| 584 | 4 Wed. | 2 Mar. 1188* (62) | *621 | 4 Wed. | 24 Jan. 1224* (24) | 658 | 5 Thurs. | 18 Dec. 1259 (352) |
| 585 | 1 Sun. | 19 Feb. 1189 (50) | 622 | 2 Mon. | 13 Jan. 1225 (13) | *659 | 2 Mon. | 6 Dec. 1260* (341) |
| *586 | 5 Thurs. | 8 Feb. 1190 (39) | 623 | 6 Fri. | 2 Jan. 1226 (2) | 660 | 0 Sat. | 26 Nov. 1261 (330) |
| 587 | 3 Tues. | 29 Jan. 1191 (29) | *624 | 3 Tues. | 22 Dec. 1226 (356) | 661 | 4 Wed. | 15 Nov. 1262 (319) |
| *588 | 0 Sat. | 18 Jan. 1192* (18) | 625 | 1 Sun. | 12 Dec. 1227 (346) | *662 | 1 Sun. | 4 Nov. 1263 (308) |
| 589 | 5 Thurs. | 7 Jan. 1193 (7) | *626 | 5 Thurs. | 30 Nov. 1228* (335) | 663 | 6 Fri. | 24 Oct. 1264* (298) |
| 590 | 2 Mon. | 27 Dec. 1193 (361) | 627 | 3 Tues. | 20 Nov. 1229 (324) | 664 | 3 Tues. | 13 Oct. 1265 (286) |
| *591 | 6 Fri. | 16 Dec. 1194 (350) | 628 | 0 Sat. | 9 Nov. 1230 (313) | *665 | 0 Sat. | 2 Oct. 1266 (275) |
| 592 | 4 Wed. | 6 Dec. 1195 (340) | *629 | 4 Wed. | 29 Oct. 1231 (302) | 666 | 5 Thurs. | 22 Sep. 1267 (265) |

# TABLE XVI. (CONTINUED.)

## INITIAL DAYS OF MUHAMMADAN YEARS OF THE HIJRA.

N.B. i. *Asterisks indicate Leap-years.*

ii. *Up to Hijra 1165 inclusive, the A.D. dates are Old Style.*

| Hijra year. | Commencement of the year. | | Hijra year. | Commencement of the year. | | Hijra year. | Commencement of the year. | |
|---|---|---|---|---|---|---|---|---|
| | Weekday. | Date A.D. | | Weekday. | Date A.D. | | Weekday. | Date A.D. |
| 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| *667 | 2 Mon. | 10 Sep. 1268* (254) | 704 | 3 Tues. | 4 Aug. 1304* (217) | *741 | 3 Tues. | 27 June 1340* (179) |
| 668 | 0 Sat. | 31 Aug. 1269 (243) | 705 | 0 Sat. | 24 July 1305 (205) | 742 | 1 Sun. | 17 June 1341 (168) |
| 669 | 4 Wed. | 20 Aug. 1270 (232) | *706 | 4 Wed. | 13 July 1306 (194) | 743 | 5 Thurs. | 6 June 1342 (157) |
| *670 | 1 Sun. | 9 Aug. 1271 (221) | 707 | 2 Mon. | 3 July 1307 (184) | *744 | 2 Mon. | 26 May 1343 (146) |
| 671 | 6 Fri. | 29 July 1272* (211) | *708 | 6 Fri. | 21 June 1308* (173) | 745 | 0 Sat. | 15 May 1344* (136) |
| 672 | 3 Tues. | 18 July 1273 (199) | 709 | 4 Wed. | 11 June 1309 (162) | *746 | 4 Wed. | 4 May 1345 (124) |
| *673 | 0 Sat. | 7 July 1274 (188) | 710 | 1 Sun. | 31 May 1310 (151) | 747 | 2 Mon. | 24 Apr. 1346 (114) |
| 674 | 5 Thurs. | 27 June 1275 (178) | *711 | 5 Thurs. | 20 May 1311 (140) | 748 | 6 Fri. | 13 Apr. 1347 (103) |
| 675 | 2 Mon. | 15 June 1276* (167) | 712 | 3 Tues. | 9 May 1312* (130) | *749 | 3 Tues. | 1 Apr. 1348* (92) |
| *676 | 6 Fri. | 4 June 1277 (155) | 713 | 0 Sat. | 28 Apr. 1313 (118) | 750 | 1 Sun. | 22 Mar. 1349 (81) |
| 677 | 4 Wed. | 25 May 1278 (145) | *714 | 4 Wed. | 17 Apr. 1314 (107) | 751 | 5 Thurs. | 11 Mar. 1350 (70) |
| *678 | 1 Sun. | 14 May 1279 (134) | 715 | 2 Mon. | 7 Apr. 1315 (97) | *752 | 2 Mon. | 28 Feb. 1351 (59) |
| 679 | 6 Fri. | 3 May 1280* (124) | *716 | 6 Fri. | 26 Mar. 1316* (86) | 753 | 0 Sat. | 18 Feb. 1352* (49) |
| 680 | 3 Tues. | 22 Apr. 1281 (112) | 717 | 4 Wed. | 16 Mar. 1317 (75) | 754 | 4 Wed. | 6 Feb. 1353 (37) |
| *681 | 0 Sat. | 11 Apr. 1282 (101) | 718 | 1 Sun. | 5 Mar. 1318 (64) | *755 | 1 Sun. | 26 Jan. 1354 (26) |
| 682 | 5 Thurs. | 1 Apr. 1283 (91) | *719 | 5 Thurs. | 22 Feb. 1319 (53) | 756 | 6 Fri. | 16 Jan. 1355 (16) |
| 683 | 2 Mon. | 20 Mar. 1284* (80) | 720 | 3 Tues. | 12 Feb. 1320* (43) | *757 | 3 Tues. | 5 Jan. 1356* (5) |
| *684 | 6 Fri. | 9 Mar. 1285 (68) | 721 | 0 Sat. | 31 Jan. 1321 (31) | 758 | 1 Sun. | 25 Dec. 1356* (360) |
| 685 | 4 Wed. | 27 Feb. 1286 (58) | *722 | 4 Wed. | 20 Jan. 1322 (20) | 759 | 5 Thurs. | 14 Dec. 1357 (348) |
| *686 | 1 Sun. | 16 Feb. 1287 (47) | 723 | 2 Mon. | 10 Jan. 1323 (10) | *760 | 2 Mon. | 3 Dec. 1358 (337) |
| 687 | 6 Fri. | 6 Feb. 1288* (37) | 724 | 6 Fri. | 30 Dec. 1323 (364) | 761 | 0 Sat. | 23 Nov. 1359 (327) |
| 688 | 3 Tues. | 25 Jan. 1289 (25) | *725 | 3 Tues. | 18 Dec. 1324* (353) | 762 | 4 Wed. | 11 Nov. 1360* (316) |
| *689 | 0 Sat. | 14 Jan. 1290 (14) | 726 | 1 Sun. | 8 Dec. 1325 (342) | *763 | 1 Sun. | 31 Oct. 1361 (304) |
| 690 | 5 Thurs. | 4 Jan. 1291 (4) | *727 | 5 Thurs. | 27 Nov. 1326 (331) | 764 | 6 Fri. | 21 Oct. 1362 (294) |
| 691 | 2 Mon. | 24 Dec. 1291 (358) | 728 | 3 Tues. | 17 Nov. 1327 (321) | 765 | 3 Tues. | 10 Oct. 1363 (283) |
| *692 | 6 Fri. | 12 Dec. 1292* (347) | 729 | 0 Sat. | 5 Nov. 1328* (310) | *766 | 0 Sat. | 28 Sep. 1364* (272) |
| 693 | 4 Wed. | 2 Dec. 1293 (336) | *730 | 4 Wed. | 25 Oct. 1329 (298) | 767 | 5 Thurs. | 18 Sep. 1365 (261) |
| 694 | 1 Sun. | 21 Nov. 1294 (325) | 731 | 2 Mon. | 15 Oct. 1330 (288) | *768 | 2 Mon. | 7 Sep. 1366 (250) |
| *695 | 5 Thurs. | 10 Nov. 1295 (314) | 732 | 6 Fri. | 4 Oct. 1331 (277) | 769 | 0 Sat. | 28 Aug. 1367 (240) |
| 696 | 3 Tues. | 30 Oct. 1296* (304) | *733 | 3 Tues. | 22 Sep. 1332* (266) | 770 | 4 Wed. | 16 Aug. 1368* (229) |
| *697 | 0 Sat. | 19 Oct. 1297 (292) | 734 | 1 Sun. | 12 Sep. 1333 (255) | *771 | 1 Sun. | 5 Aug. 1369 (217) |
| 698 | 5 Thurs. | 9 Oct. 1298 (282) | 735 | 5 Thurs. | 1 Sep. 1334 (244) | 772 | 6 Fri. | 26 July 1370 (207) |
| 699 | 2 Mon. | 28 Sep. 1299 (271) | *736 | 2 Mon. | 21 Aug. 1335 (233) | 773 | 3 Tues. | 15 July 1371 (196) |
| *700 | 6 Fri. | 16 Sep. 1300* (260) | 737 | 0 Sat. | 10 Aug. 1336* (223) | *774 | 0 Sat. | 3 July 1372* (185) |
| 701 | 4 Wed. | 6 Sep. 1301 (249) | *738 | 4 Wed. | 30 July 1337 (211) | 775 | 5 Thurs. | 23 June 1373 (174) |
| 702 | 1 Sun. | 26 Aug. 1302 (238) | 739 | 2 Mon. | 20 July 1338 (201) | *776 | 2 Mon. | 12 June 1374 (163) |
| *703 | 5 Thurs. | 15 Aug. 1303 (227) | 740 | 6 Fri. | 9 July 1339 (190) | 777 | 0 Sat. | 2 June 1375 (153) |

# TABLE XVI. (CONTINUED.)

## INITIAL DAYS OF MUHAMMADAN YEARS OF THE HIJRA

N.B. i. *Asterisks indicate Leap-years.*

ii. *Up to Hijra 1165 inclusive, the A.D. dates are Old Style.*

| Hijra year. | Commencement of the year. Weekday | Commencement of the year. Date A.D. | Hijra year. | Commencement of the year. Weekday | Commencement of the year. Date A.D. | Hijra year. | Commencement of the year. Weekday | Commencement of the year. Date A.D. |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| 778 | 4 Wed. | 21 May 1376* (142) | *815 | 4 Wed. | 13 Apr. 1412* (104) | 852 | 5 Thurs. | 7 Mar. 1448* (67) |
| *779 | 1 Sun. | 10 May 1377 (130) | 816 | 2 Mon. | 3 Apr. 1413 (93) | *853 | 2 Mon. | 24 Feb. 1449 (55) |
| 780 | 6 Fri. | 30 Apr. 1378 (120) | *817 | 6 Fri. | 23 Mar. 1414 (82) | 854 | 0 Sat. | 14 Feb. 1450 (45) |
| 781 | 3 Tues. | 19 Apr. 1379 (109) | 818 | 4 Wed. | 13 Mar. 1415 (72) | 855 | 4 Wed. | 3 Feb. 1451 (34) |
| *782 | 0 Sat. | 7 Apr. 1380* (98) | 819 | 1 Sun. | 1 Mar. 1416* (61) | *856 | 1 Sun. | 23 Jan. 1452* (23) |
| 783 | 5 Thurs. | 28 Mar. 1381 (87) | *820 | 5 Thurs. | 18 Feb. 1417 (49) | 857 | 6 Fri. | 12 Jan. 1453 (12) |
| 784 | 2 Mon. | 17 Mar. 1382 (76) | 821 | 3 Tues. | 8 Feb. 1418 (39) | *858 | 3 Tues. | 1 Jan. 1454 (1) |
| *785 | 6 Fri. | 6 Mar. 1383 (65) | 822 | 0 Sat. | 28 Jan. 1419 (28) | 859 | 1 Sun. | 22 Dec. 1454 (356) |
| 786 | 4 Wed. | 24 Feb. 1384* (55) | *823 | 4 Wed. | 17 Jan. 1420* (17) | 860 | 5 Thurs. | 11 Dec. 1455 (345) |
| *787 | 1 Sun. | 12 Feb. 1385 (43) | 824 | 2 Mon. | 6 Jan. 1421 (6) | *861 | 2 Mon. | 29 Nov. 1456* (334) |
| 788 | 6 Fri. | 2 Feb. 1386 (33) | 825 | 6 Fri. | 26 Dec. 1421 (360) | 862 | 0 Sat. | 19 Nov. 1457 (323) |
| 789 | 3 Tues. | 22 Jan. 1387 (22) | *826 | 3 Tues. | 15 Dec. 1422 (349) | 863 | 4 Wed. | 8 Nov. 1458 (312) |
| *790 | 0 Sat. | 11 Jan. 1388* (11) | 827 | 1 Sun. | 5 Dec. 1423 (339) | *864 | 1 Sun. | 28 Oct. 1459 (301) |
| 791 | 5 Thurs. | 31 Dec. 1388* (366) | *828 | 5 Thurs. | 23 Nov. 1424* (328) | 865 | 6 Fri. | 17 Oct. 1460* (291) |
| 792 | 2 Mon. | 20 Dec. 1389 (354) | 829 | 3 Tues. | 13 Nov. 1425 (317) | *866 | 3 Tues. | 6 Oct. 1461 (279) |
| *793 | 6 Fri. | 9 Dec. 1390 (343) | 830 | 0 Sat. | 2 Nov. 1426 (306) | 867 | 1 Sun. | 26 Sep. 1462 (269) |
| 794 | 4 Wed. | 29 Nov. 1391 (333) | *831 | 4 Wed. | 22 Oct. 1427 (295) | 868 | 5 Thurs. | 15 Sep. 1463 (258) |
| 795 | 1 Sun. | 17 Nov. 1392* (322) | 832 | 2 Mon. | 11 Oct. 1428* (285) | *869 | 2 Mon. | 3 Sep. 1464* (247) |
| *796 | 5 Thurs. | 6 Nov. 1393 (310) | 833 | 6 Fri. | 30 Sep. 1429 (273) | 870 | 0 Sat. | 24 Aug. 1465 (236) |
| 797 | 3 Tues. | 27 Oct. 1394 (300) | *834 | 3 Tues. | 19 Sep. 1430 (262) | 871 | 4 Wed. | 13 Aug. 1466 (225) |
| *798 | 0 Sat. | 16 Oct. 1395 (289) | 835 | 1 Sun. | 9 Sep. 1431 (252) | *872 | 1 Sun. | 2 Aug. 1467 (214) |
| 799 | 5 Thurs. | 5 Oct. 1396* (279) | *836 | 5 Thurs. | 28 Aug. 1432* (241) | 873 | 6 Fri. | 22 July 1468* (204) |
| 800 | 2 Mon. | 24 Sep. 1397 (267) | 837 | 3 Tues. | 18 Aug. 1433 (230) | 874 | 3 Tues. | 11 July 1469 (192) |
| *801 | 6 Fri. | 13 Sep. 1398 (256) | 838 | 0 Sat. | 7 Aug. 1434 (219) | *875 | 0 Sat. | 30 June 1470 (181) |
| 802 | 4 Wed. | 3 Sep. 1399 (246) | *839 | 4 Wed. | 27 July 1435 (208) | 876 | 5 Thurs. | 20 June 1471 (171) |
| 803 | 1 Sun. | 22 Aug. 1400* (235) | 840 | 2 Mon. | 16 July 1436* (198) | *877 | 2 Mon. | 8 June 1472* (160) |
| *804 | 5 Thurs. | 11 Aug. 1401 (223) | 841 | 6 Fri. | 5 July 1437 (186) | 878 | 0 Sat. | 29 May 1473 (149) |
| 805 | 3 Tues. | 1 Aug. 1402 (213) | *842 | 3 Tues. | 24 June 1438 (175) | 879 | 4 Wed. | 18 May 1474 (138) |
| *806 | 0 Sat. | 21 July 1403 (202) | 843 | 1 Sun. | 14 June 1439 (165) | *880 | 1 Sun. | 7 May 1475 (127) |
| 807 | 5 Thurs. | 10 July 1404* (192) | 844 | 5 Thurs. | 2 June 1440* (154) | 881 | 6 Fri. | 26 Apr. 1476* (117) |
| 808 | 2 Mon. | 29 June 1405 (180) | *845 | 2 Mon. | 22 May 1441 (142) | 882 | 3 Tues. | 15 Apr. 1477 (106) |
| *809 | 6 Fri. | 18 June 1406 (169) | 846 | 0 Sat. | 12 May 1442 (132) | *883 | 0 Sat. | 4 Apr. 1478 (94) |
| 810 | 4 Wed. | 8 June 1407 (159) | *847 | 4 Wed. | 1 May 1443 (121) | 884 | 5 Thurs. | 25 Mar. 1479 (84) |
| 811 | 1 Sun. | 27 May 1408* (148) | 848 | 2 Mon. | 20 Apr. 1444* (111) | 885 | 2 Mon. | 13 Mar. 1480* (73) |
| *812 | 5 Thurs. | 16 May 1409 (136) | 849 | 6 Thurs. | 9 Apr. 1445 (99) | *886 | 6 Fri. | 2 Mar. 1481 (61) |
| 813 | 3 Tues. | 6 May 1410 (126) | *850 | 3 Tues. | 29 Mar. 1446 (88) | 887 | 4 Wed. | 20 Feb. 1482 (51) |
| 814 | 0 Sat. | 25 Apr. 1411 (115) | 851 | 1 Sun. | 19 Mar. 1447 (78) | *888 | 1 Sun. | 9 Feb. 1483 (40) |

# TABLE XVI. (CONTINUED.)

## INITIAL DAYS OF MUHAMMADAN YEARS OF THE HIJRA

N.B. i *Asterisks indicate Leap-years.*

ii. *Up to Hijra 1165 inclusive, the A.D. dates are Old Style.*

| Hijra year | Commencement of the year. | | Hijra year. | Commencement of the year. | | Hijra year. | Commencement of the year | |
|---|---|---|---|---|---|---|---|---|
| | Weekday | Date A.D. | | Weekday. | Date A.D. | | Weekday. | Date A.D. |
| 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| 889 | 6 Fri. | 30 Jan. 1484* (30) | *926 | 6 Fri. | 23 Dec. 1519 (357) | 963 | 0 Sat. | 16 Nov. 1555 (320) |
| 890 | 3 Tues. | 18 Jan. 1485 (18) | 927 | 4 Wed. | 12 Dec. 1520* (347) | 964 | 4 Wed. | 4 Nov. 1556* (309) |
| *891 | 0 Sat. | 7 Jan. 1486 (7) | 928 | 1 Sun. | 1 Dec. 1521 (335) | *965 | 1 Sun. | 24 Oct. 1557 (297) |
| 892 | 5 Thurs. | 28 Dec. 1486 (362) | *929 | 5 Thurs. | 20 Nov. 1522 (324) | 966 | 6 Fri. | 14 Oct. 1558 (287) |
| 893 | 2 Mon. | 17 Dec. 1487 (351) | 930 | 3 Tues. | 10 Nov. 1523 (314) | *967 | 3 Tues. | 3 Oct. 1559 (276) |
| *894 | 6 Fri. | 5 Dec. 1488* (340) | 931 | 0 Sat. | 29 Oct. 1524* (303) | 968 | 1 Sun. | 22 Sep. 1560* (266) |
| 895 | 4 Wed. | 25 Nov. 1489 (329) | *932 | 4 Wed. | 18 Oct. 1525 (291) | 969 | 5 Thurs. | 11 Sep. 1561 (254) |
| *896 | 1 Sun. | 14 Nov. 1490 (318) | 933 | 2 Mon. | 8 Oct. 1526 (281) | *970 | 2 Mon. | 31 Aug. 1562 (243) |
| 897 | 6 Fri. | 4 Nov. 1491 (308) | 934 | 6 Fri. | 27 Sep. 1527 (270) | 971 | 0 Sat. | 21 Aug. 1563 (233) |
| 898 | 3 Tues. | 23 Oct. 1492* (297) | *935 | 3 Tues. | 15 Sep. 1528* (259) | 972 | 4 Wed. | 9 Aug. 1564* (222) |
| *899 | 0 Sat. | 12 Oct. 1493 (285) | 936 | 1 Sun. | 5 Sep. 1529 (248) | *973 | 1 Sun. | 29 July 1565 (210) |
| 900 | 5 Thurs. | 2 Oct. 1494 (275) | *937 | 5 Thurs. | 25 Aug. 1530 (237) | 974 | 6 Fri. | 19 July 1566 (200) |
| 901 | 2 Mon. | 21 Sep. 1495 (264) | 938 | 3 Tues. | 15 Aug. 1531 (227) | 975 | 3 Tues. | 8 July 1567 (189) |
| *902 | 6 Fri. | 9 Sep. 1496* (253) | 939 | 0 Sat. | 3 Aug. 1532* (216) | *976 | 0 Sat. | 26 June 1568* (178) |
| 903 | 4 Wed. | 30 Aug. 1497 (242) | *940 | 4 Wed. | 23 July 1533 (204) | 977 | 5 Thurs. | 16 June 1569 (167) |
| 904 | 1 Sun. | 19 Aug. 1498 (231) | 941 | 2 Mon. | 13 July 1534 (194) | *978 | 2 Mon. | 5 June 1570 (156) |
| *905 | 5 Thurs. | 8 Aug. 1499 (220) | 942 | 6 Fri. | 2 July 1535 (183) | 979 | 0 Sat. | 26 May 1571 (146) |
| 906 | 3 Tues. | 28 July 1500* (210) | *943 | 3 Tues. | 20 June 1536* (172) | 980 | 4 Wed. | 14 May 1572* (135) |
| *907 | 0 Sat. | 17 July 1501 (198) | 944 | 1 Sun. | 10 June 1537 (161) | *981 | 1 Sun. | 3 May 1573 (123) |
| 908 | 5 Thurs. | 7 July 1502 (188) | 945 | 5 Thurs. | 30 May 1538 (150) | 982 | 6 Fri. | 23 Apr. 1574 (113) |
| 909 | 2 Mon. | 26 June 1503 (177) | *946 | 2 Mon. | 19 May 1539 (139) | 983 | 3 Tues. | 12 Apr. 1575 (102) |
| *910 | 6 Fri. | 14 June 1504* (166) | 947 | 0 Sat. | 8 May 1540* (129) | *984 | 0 Sat. | 31 Mar. 1576* (91) |
| 911 | 4 Wed. | 4 June 1505 (155) | *948 | 4 Wed. | 27 Apr. 1541 (117) | 985 | 5 Thurs. | 21 Mar. 1577 (80) |
| 912 | 1 Sun. | 24 May 1506 (144) | 949 | 2 Mon. | 17 Apr. 1542 (107) | *986 | 2 Mon. | 10 Mar. 1578 (69) |
| *913 | 5 Thurs. | 13 May 1507 (133) | 950 | 6 Fri. | 6 Apr. 1543 (96) | 987 | 0 Sat. | 28 Feb. 1579 (59) |
| 914 | 3 Tues. | 2 May 1508* (123) | *951 | 3 Tues. | 25 Mar. 1544* (85) | 988 | 4 Wed. | 17 Feb. 1580* (48) |
| 915 | 0 Sat. | 21 Apr. 1509 (111) | 952 | 1 Sun. | 15 Mar. 1545 (74) | *989 | 1 Sun. | 5 Feb. 1581 (36) |
| *916 | 4 Wed. | 10 Apr. 1510 (100) | 953 | 5 Thurs. | 4 Mar. 1546 (63) | 990 | 6 Fri. | 26 Jan. 1582 [1]) (26) |
| 917 | 2 Mon. | 31 Mar. 1511 (90) | *954 | 2 Mon. | 21 Feb. 1547 (52) | 991 | 3 Tues. | 15 Jan. 1583 (15) |
| *918 | 6 Fri. | 19 Mar. 1512* (79) | 955 | 0 Sat. | 11 Feb. 1548* (42) | *992 | 0 Sat. | 4 Jan. 1584* (4) |
| 919 | 4 Wed. | 9 Mar. 1513 (68) | *956 | 4 Wed. | 30 Jan. 1549 (30) | 993 | 5 Thurs. | 24 Dec. 1584* (359) |
| 920 | 1 Sun. | 26 Feb. 1514 (57) | 957 | 2 Mon. | 20 Jan. 1550 (20) | 994 | 2 Mon. | 13 Dec. 1585 (347) |
| *921 | 5 Thurs. | 15 Feb. 1515 (46) | 958 | 6 Fri. | 9 Jan. 1551 (9) | *995 | 6 Fri. | 2 Dec. 1586 (336) |
| 922 | 3 Tues. | 5 Feb. 1516* (36) | *959 | 3 Tues. | 29 Dec. 1551 (363) | 996 | 4 Wed. | 22 Nov. 1587 (326) |
| 923 | 0 Sat. | 24 Jan. 1517 (24) | 960 | 1 Sun. | 18 Dec. 1552* (353) | *997 | 1 Sun. | 10 Nov. 1588* (315) |
| *924 | 4 Wed. | 13 Jan. 1518 (13) | 961 | 5 Thurs. | 7 Dec. 1553 (341) | 998 | 6 Fri. | 31 Oct. 1589 (304) |
| 925 | 2 Mon. | 3 Jan. 1519 (3) | *962 | 2 Mon. | 26 Nov. 1554 (330) | 999 | 3 Tues. | 20 Oct. 1590 (293) |

[1]) In the Roman Catholic countries of Europe the New Style was introduced from October 5th 1582 A.D. and the year 1700 was ordered to be a common, not a Leap-year. Dates in the above Table are however for English reckoning, where the New Style was not introduced till Sept. 3rd 1752 A.D. For the initial dates of the Hijra years, therefore, in the former countries, add 10 days to the date given in the Table from Hijra 991 to Hijra 1111 inclusive, and 11 days from Hijra 1112 to Hijra 1165 inclusive.

# TABLE XVI. (CONTINUED)

## INITIAL DAYS OF MUHAMMADAN YEARS OF THE HIJRA

N.B. i. *Asterisks indicate Leap-years.*

ii. *Up to Hijra 1165 inclusive, the A.D. dates are Old Style.*

| Hijra year | Commencement of the year | | Hijra year | Commencement of the year. | | Hijra year | Commencement of the year. | |
|---|---|---|---|---|---|---|---|---|
| | Weekday. | Date A.D. | | Weekday. | Date A.D. | | Weekday. | Date A.D. |
| 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| *1000 | 0 Sat. | 9 Oct. 1591 (282) | 1037 | 1 Sun. | 2 Sep. 1627 (245) | *1074 | 1 Sun. | 26 July 1663 (207) |
| 1001 | 5 Thurs. | 28 Sep. 1592* (272) | *1038 | 5 Thurs. | 21 Aug. 1628* (234) | 1075 | 6 Fri. | 15 July 1664* (197) |
| 1002 | 2 Mon. | 17 Sep. 1593 (260) | 1039 | 3 Tues. | 11 Aug. 1629 (223) | *1076 | 3 Tues. | 4 July 1665 (185) |
| *1003 | 6 Fri. | 6 Sep. 1594 (249) | 1040 | 0 Sat. | 31 July 1630 (212) | 1077 | 1 Sun. | 24 June 1666 (175) |
| 1004 | 4 Wed. | 27 Aug. 1595 (239) | *1041 | 4 Wed. | 20 July 1631 (201) | 1778 | 5 Thurs. | 13 June 1667 (164) |
| 1005 | 1 Sun. | 15 Aug. 1596* (228) | 1042 | 2 Mon. | 9 July 1632* (191) | *1079 | 2 Mon. | 1 June 1668* (153) |
| *1006 | 5 Thurs. | 4 Aug. 1597 (216) | 1043 | 6 Fri. | 28 June 1633 (179) | 1080 | 0 Sat. | 22 May 1669 (142) |
| 1007 | 3 Tues. | 25 July 1598 (206) | *1044 | 3 Tues. | 17 June 1634 (168) | 1081 | 4 Wed. | 11 May 1670 (131) |
| *1008 | 0 Sat. | 14 July 1599 (195) | 1045 | 1 Sun. | 7 June 1635 (158) | *1082 | 1 Sun. | 30 Apr. 1671 (120) |
| 1009 | 5 Thurs. | 3 July 1600* (185) | *1046 | 5 Thurs. | 26 May 1636* (147) | 1083 | 6 Fri. | 19 Apr. 1672* (110) |
| 1010 | 2 Mon. | 22 June 1601 (173) | 1047 | 3 Tues. | 16 May 1637 (136) | 1084 | 3 Tues. | 8 Apr. 1673 (98) |
| *1011 | 6 Fri. | 11 June 1602 (162) | 1048 | 0 Sat. | 5 May 1638 (125) | *1085 | 0 Sat. | 28 Mar. 1674 (87) |
| 1012 | 4 Wed. | 1 June 1603 (152) | *1049 | 4 Wed. | 24 Apr. 1639 (114) | 1086 | 5 Thurs. | 18 Mar. 1675 (77) |
| 1013 | 1 Sun. | 20 May 1604* (141) | 1050 | 2 Mon. | 13 Apr. 1640* (104) | *1087 | 2 Mon. | 6 Mar. 1676* (66) |
| *1014 | 5 Thurs. | 9 May 1605 (129) | 1051 | 6 Fri. | 2 Apr. 1641 (92) | 1088 | 0 Sat. | 24 Feb. 1677 (55) |
| 1015 | 3 Tues. | 29 Apr. 1606 (119) | *1052 | 3 Tues. | 22 Mar. 1642 (81) | 1089 | 4 Wed. | 13 Feb. 1678 (44) |
| *1016 | 0 Sat. | 18 Apr. 1607 (108) | 1053 | 1 Sun. | 12 Mar. 1643 (71) | *1090 | 1 Sun. | 2 Feb. 1679 (33) |
| 1017 | 5 Thurs. | 7 Apr. 1608* (98) | 1054 | 5 Thurs. | 29 Feb. 1644* (60) | 1091 | 6 Fri. | 23 Jan. 1680* (23) |
| 1018 | 2 Mon. | 27 Mar. 1609 (86) | *1055 | 2 Mon. | 17 Feb. 1645 (48) | 1092 | 3 Tues. | 11 Jan. 1681 (11) |
| *1019 | 6 Fri. | 16 Mar. 1610 (75) | 1056 | 0 Sat. | 7 Feb. 1646 (38) | *1093 | 0 Sat. | 31 Dec. 1681 (365) |
| 1020 | 4 Wed. | 6 Mar. 1611 (65) | *1057 | 4 Wed. | 27 Jan. 1647 (27) | 1094 | 5 Thurs. | 21 Dec. 1682 (355) |
| 1021 | 1 Sun. | 23 Feb. 1612* (54) | 1058 | 2 Mon. | 17 Jan. 1648* (17) | 1095 | 2 Mon. | 10 Dec. 1683 (344) |
| *1022 | 5 Thurs. | 11 Feb. 1613 (42) | 1059 | 6 Fri. | 5 Jan. 1649 (5) | *1096 | 6 Fri. | 28 Nov. 1684* (333) |
| 1023 | 3 Tues. | 1 Feb. 1614 (32) | *1060 | 3 Tues. | 25 Dec. 1649 (359) | 1097 | 4 Wed. | 18 Nov. 1685 (322) |
| 1024 | 0 Sat. | 21 Jan. 1615 (21) | 1061 | 1 Sun. | 15 Dec. 1650 (349) | *1098 | 1 Sun. | 7 Nov. 1686 (311) |
| *1025 | 4 Wed. | 10 Jan. 1616* (10) | 1062 | 5 Thurs. | 4 Dec. 1651 (338) | 1099 | 6 Fri. | 28 Oct. 1687 (301) |
| 1026 | 2 Mon. | 30 Dec. 1616* (365) | *1063 | 2 Mon. | 22 Nov. 1652* (327) | 1100 | 3 Tues. | 16 Oct. 1688* (290) |
| *1027 | 6 Fri. | 19 Dec. 1617 (353) | 1064 | 0 Sat. | 12 Nov. 1653 (316) | *1101 | 0 Sat. | 5 Oct. 1689 (278) |
| 1028 | 4 Wed. | 9 Dec. 1618 (343) | 1065 | 4 Wed. | 1 Nov. 1654 (305) | 1102 | 5 Thurs. | 25 Sep. 1690 (268) |
| 1029 | 1 Sun. | 28 Nov. 1619 (332) | *1066 | 1 Sun. | 21 Oct. 1655 (294) | 1103 | 2 Mon. | 14 Sep. 1691 (257) |
| *1030 | 5 Thurs. | 16 Nov. 1620* (321) | 1067 | 6 Fri. | 10 Oct. 1656* (284) | *1104 | 6 Fri. | 2 Sep. 1692* (246) |
| 1031 | 3 Tues. | 6 Nov. 1621 (310) | *1068 | 3 Tues. | 29 Sep. 1657 (272) | 1105 | 4 Wed. | 23 Aug. 1693 (235) |
| 1032 | 0 Sat. | 26 Oct. 1622 (299) | 1069 | 1 Sun. | 19 Sep. 1658 (262) | *1106 | 1 Sun. | 12 Aug. 1694 (224) |
| *1033 | 4 Wed. | 15 Oct. 1623 (288) | 1070 | 5 Thurs. | 8 Sep. 1659 (251) | 1107 | 6 Fri. | 2 Aug. 1695 (214) |
| 1034 | 2 Mon. | 4 Oct. 1624* (278) | *1071 | 2 Mon. | 27 Aug. 1660* (240) | 1108 | 3 Tues. | 21 July 1696* (203) |
| 1035 | 6 Fri. | 23 Sep. 1625 (266) | 1072 | 0 Sat. | 17 Aug. 1661 (229) | *1109 | 0 Sat. | 10 July 1697 (191) |
| *1036 | 3 Tues. | 12 Sep. 1626 (255) | 1073 | 4 Wed. | 6 Aug. 1662 (218) | 1116 | 5 Thurs. | 30 June 1698 (181) |

# TABLE XVI. (CONTINUED.)

## INITIAL DAYS OF MUHAMMADAN YEARS OF THE HIJRA.

N.B. i. *Asterisks indicate Leap-years.*

ii. *Up to Hijra 1165 inclusive, the A.D. dates are Old Style.*

| Hijra year | Commencement of the year. | | Hijra year. | Commencement of the year. | | Hijra year. | Commencement of the year. | |
|---|---|---|---|---|---|---|---|---|
| | Weekday | Date A.D. | | Weekday. | Date A.D. | | Weekday. | Date A.D. |
| 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| 1111 | 2 Mon. | 19 June 1699 (170) | 1148 | 3 Tues. | 13 May 1735 (133) | 1185 | 3 Tues. | 16 Apr. 1771 (106) |
| *1112 | 6 Fri. | 7 June 1700* (159) | 1149 | 0 Sat. | 1 May 1736* (122) | *1186 | 0 Sat. | 4 Apr. 1772* (95) |
| 1113 | 4 Wed. | 28 May 1701 (148) | *1150 | 4 Wed. | 20 Apr. 1737 (110) | 1187 | 5 Thurs. | 25 Mar. 1773 (84) |
| 1114 | 1 Sun. | 17 May 1702 (137) | 1151 | 2 Mon. | 10 Apr. 1738 (100) | *1188 | 2 Mon. | 14 Mar. 1774 (73) |
| *1115 | 5 Thurs. | 6 May 1703 (126) | 1152 | 6 Fri. | 30 Mar. 1739 (89) | 1189 | 0 Sat. | 4 Mar. 1775 (63) |
| 1116 | 3 Tues. | 25 Apr. 1704* (116) | *1153 | 3 Tues. | 18 Mar. 1740* (78) | 1190 | 4 Wed. | 21 Feb. 1776* (52) |
| *1117 | 0 Sat. | 14 Apr. 1705 (104) | 1154 | 1 Sun. | 8 Mar. 1741 (67) | *1191 | 1 Sun. | 9 Feb. 1777 (40) |
| 1118 | 5 Thurs. | 4 Apr. 1706 (94) | 1155 | 5 Thurs. | 25 Feb. 1742 (56) | 1192 | 6 Fri. | 30 Jan. 1778 (30) |
| 1119 | 2 Mon. | 24 Mar. 1707 (83) | *1156 | 2 Mon. | 14 Feb. 1743 (45) | 1193 | 3 Tues. | 19 Jan. 1779 (19) |
| *1120 | 6 Fri. | 12 Mar. 1708* (72) | 1157 | 0 Sat. | 4 Feb. 1744* (35) | *1194 | 0 Sat. | 8 Jan. 1780* (8) |
| 1121 | 4 Wed. | 2 Mar. 1709 (61) | *1158 | 4 Wed. | 23 Jan. 1745 (23) | 1195 | 5 Thurs. | 28 Dec. 1780* (363) |
| 1122 | 1 Sun. | 19 Feb. 1710 (50) | 1159 | 2 Mon. | 13 Jan. 1746 (13) | *1196 | 2 Mon. | 17 Dec. 1781 (351) |
| *1123 | 5 Thurs. | 8 Feb. 1711 (39) | 1160 | 6 Fri. | 2 Jan. 1747 (2) | 1197 | 0 Sat. | 7 Dec. 1782 (341) |
| 1124 | 3 Tues. | 29 Jan. 1712* (29) | *1161 | 3 Tues. | 22 Dec. 1747 (356) | 1198 | 4 Wed. | 26 Nov. 1783 (330) |
| 1125 | 0 Sat. | 17 Jan. 1713 (17) | 1162 | 1 Sun. | 11 Dec. 1748* (346) | *1199 | 1 Sun. | 14 Nov. 1784* (319) |
| *1126 | 4 Wed. | 6 Jan. 1714 (6) | 1163 | 5 Thurs. | 30 Nov. 1749 (334) | 1200 | 6 Fri. | 4 Nov. 1785 (308) |
| 1127 | 2 Mon. | 27 Dec. 1714 (361) | *1164 | 2 Mon. | 19 Nov. 1750 (323) | 1201 | 3 Tues. | 24 Oct. 1786 (297) |
| *1128 | 6 Fri. | 16 Dec. 1715 (350) | 1165 | 0 Sat. | 9 Nov. 1751† (313) | *1202 | 0 Sat. | 13 Oct. 1787 (286) |
| 1129 | 4 Wed. | 5 Dec. 1716* (340) | *1166 | 4 Wed. | 8 Nov. 1752* (313) | 1203 | 5 Thurs. | 2 Oct. 1788* (276) |
| 1130 | 1 Sun. | 24 Nov. 1717 (328) | 1167 | 2 Mon. | 29 Oct. 1753 (302) | 1204 | 2 Mon. | 21 Sep. 1789 (264) |
| *1131 | 5 Thurs. | 13 Nov. 1718 (317) | 1168 | 6 Fri. | 18 Oct. 1754 (291) | *1205 | 6 Fri. | 10 Sep. 1790 (253) |
| 1132 | 3 Tues. | 3 Nov. 1719 (307) | *1169 | 3 Tues. | 7 Oct. 1755 (280) | 1206 | 4 Wed. | 31 Aug. 1791 (243) |
| 1133 | 0 Sat. | 22 Oct. 1720* (296) | 1170 | 1 Sun. | 26 Sep. 1756* (270) | *1207 | 1 Sun. | 19 Aug. 1792* (232) |
| *1134 | 4 Wed. | 11 Oct. 1721 (284) | 1171 | 5 Thurs. | 15 Sep. 1757 (258) | 1208 | 6 Fri. | 9 Aug. 1793 (221) |
| 1135 | 2 Mon. | 1 Oct. 1722 (274) | *1172 | 2 Mon. | 4 Sep. 1758 (247) | 1209 | 3 Tues. | 29 July 1794 (210) |
| *1136 | 6 Fri. | 20 Sep. 1723 (263) | 1173 | 0 Sat. | 25 Aug. 1759 (237) | *1210 | 0 Sat. | 18 July 1795 (199) |
| 1137 | 4 Wed. | 9 Sep. 1724* (253) | 1174 | 4 Wed. | 13 Aug. 1760* (226) | 1211 | 5 Thurs. | 7 July 1796* (189) |
| 1138 | 1 Sun. | 29 Aug. 1725 (241) | *1175 | 1 Sun. | 2 Aug. 1761 (214) | 1212 | 2 Mon. | 26 June 1797 (177) |
| *1139 | 5 Thurs. | 18 Aug. 1726 (230) | 1176 | 6 Fri. | 23 July 1762 (204) | *1213 | 6 Fri. | 15 June 1798 (166) |
| 1140 | 3 Tues. | 8 Aug. 1727 (220) | *1177 | 3 Tues. | 12 July 1763 (193) | 1214 | 4 Wed. | 5 June 1799 (156) |
| 1141 | 0 Sat. | 27 July 1728* (209) | 1178 | 1 Sun. | 1 July 1764* (183) | 1215 | 1 Sun. | 25 May 1800 (145) |
| *1142 | 4 Wed. | 16 July 1729 (197) | 1179 | 5 Thurs. | 20 June 1765 (171) | *1216 | 5 Thurs. | 14 May 1801 (134) |
| 1143 | 2 Mon. | 6 July 1730 (187) | *1180 | 2 Mon. | 9 June 1766 (160) | 1217 | 3 Tues. | 4 May 1802 (124) |
| 1144 | 6 Fri. | 25 June 1731 (176) | 1181 | 0 Sat. | 30 May 1767 (150) | *1218 | 0 Sat. | 23 Apr. 1803 (113) |
| *1145 | 3 Tues. | 13 June 1732* (165) | 1182 | 4 Wed. | 18 May 1768* (139) | 1219 | 5 Thurs. | 12 Apr. 1804* (103) |
| 1146 | 1 Sun. | 3 June 1733 (154) | *1183 | 1 Sun. | 7 May 1769 (127) | 1220 | 2 Mon. | 1 Apr. 1805 (91) |
| *1147 | 5 Thurs. | 23 May 1734 (143) | 1184 | 6 Fri. | 27 Apr. 1770 (117) | *1221 | 6 Fri. | 21 Mar. 1806 (80) |

† The New Style was introduced into England from 3rd September, 1752. The 9th November, 1751, is therefore an Old Style date, and the 8th November, 1752, is a New Style one (see above, *Note* 2. p. 11, *Note* 1, p. 88).

# TABLE XVI. (CONTINUED.)

## INITIAL DAYS OF MUHAMMADAN YEARS OF THE HIJRA.

N.B. i. *Asterisks indicate Leap-years.*
ii. *Up to Hijra* 1165 *inclusive, the A.D. dates are Old Style.*

| Hijra year. | Commencement of the year. Weekday. | Date A.D. | Hijra year. | Commencement of the year. Weekday. | Date A.D. | Hijra year. | Commencement of the year. Weekday. | Date A.D. |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| 1222 | 4 Wed. | 11 Mar. 1807 (70) | 1255 | 1 Sun. | 17 Mar. 1839 (76) | 1288 | 5 Thurs. | 23 Mar. 1871 (82) |
| 1223 | 1 Sun. | 28 Feb. 1808* (59) | *1256 | 5 Thurs. | 5 Mar. 1840* (65) | *1289 | 2 Mon. | 11 Mar. 1872* (71) |
| *1224 | 5 Thurs. | 16 Feb. 1809 (47) | 1257 | 3 Tues. | 23 Feb. 1841 (54) | 1290 | 0 Sat. | 1 Mar. 1873 (60) |
| 1225 | 3 Tues. | 6 Feb. 1810 (37) | 1258 | 0 Sat. | 12 Feb. 1842 (43) | 1291 | 4 Wed. | 18 Feb. 1874 (49) |
| *1226 | 0 Sat. | 26 Jan. 1811 (26) | *1259 | 4 Wed. | 1 Feb. 1843 (32) | *1292 | 1 Sun. | 7 Feb. 1875 (38) |
| 1227 | 5 Thurs. | 16 Jan. 1812* (16) | 1260 | 2 Mon. | 22 Jan. 1844* (22) | 1293 | 6 Fri. | 28 Jan. 1876* (28) |
| 1228 | 2 Mon. | 4 Jan. 1813 (4) | 1261 | 6 Fri. | 10 Jan. 1845 (10) | 1294 | 3 Tues. | 16 Jan. 1877 (16) |
| *1229 | 6 Fri. | 24 Dec. 1813 (358) | *1262 | 3 Tues. | 30 Dec. 1845 (364) | *1295 | 0 Sat. | 5 Jan. 1878 (5) |
| 1230 | 4 Wed. | 14 Dec. 1814 (348) | 1263 | 1 Sun. | 20 Dec. 1846 (354) | 1296 | 5 Thurs. | 26 Dec. 1878 (360) |
| 1231 | 1 Sun. | 3 Dec. 1815 (337) | 1264 | 5 Thurs. | 9 Dec. 1847 (343) | *1297 | 2 Mon. | 15 Dec. 1879 (349) |
| *1232 | 5 Thurs. | 21 Nov. 1816* (326) | *1265 | 2 Mon. | 27 Nov. 1848* (332) | 1298 | 0 Sat. | 4 Dec. 1880* (339) |
| 1233 | 3 Tues. | 11 Nov. 1817 (315) | 1266 | 0 Sat. | 17 Nov. 1849 (321) | 1299 | 4 Wed. | 23 Nov. 1881 (327) |
| 1234 | 0 Sat. | 31 Oct. 1818 (304) | *1267 | 4 Wed. | 6 Nov. 1850 (310) | *1300 | 1 Sun. | 12 Nov. 1882 (316) |
| *1235 | 4 Wed. | 20 Oct. 1819 (293) | 1268 | 2 Mon. | 27 Oct. 1851 (300) | 1301 | 6 Fri. | 2 Nov. 1883 (306) |
| 1236 | 2 Mon. | 9 Oct. 1820* (283) | 1269 | 6 Fri. | 15 Oct. 1852* (289) | 1302 | 3 Tues. | 21 Oct. 1884* (295) |
| *1237 | 6 Fri. | 28 Sep. 1821 (271) | *1270 | 3 Tues. | 4 Oct. 1853 (277) | *1303 | 0 Sat. | 10 Oct. 1885 (283) |
| 1238 | 4 Wed. | 18 Sep. 1822 (261) | 1271 | 1 Sun. | 24 Sep. 1854 (267) | 1304 | 5 Thurs. | 30 Sep. 1886 (273) |
| 1239 | 1 Sun. | 7 Sep. 1823 (250) | 1272 | 5 Thurs. | 13 Sep. 1855 (256) | 1305 | 2 Mon. | 19 Sep. 1887 (262) |
| *1240 | 5 Thurs. | 26 Aug. 1824* (239) | *1273 | 2 Mon. | 1 Sep. 1856* (245) | *1306 | 6 Fri. | 7 Sep. 1888* (251) |
| 1241 | 3 Tues. | 16 Aug. 1825 (228) | 1274 | 0 Sat. | 22 Aug. 1857 (234) | 1307 | 4 Wed. | 28 Aug. 1889 (240) |
| 1242 | 0 Sat. | 5 Aug. 1826 (217) | 1275 | 4 Wed. | 11 Aug. 1858 (223) | *1308 | 1 Sun. | 17 Aug. 1890 (229) |
| *1243 | 4 Wed. | 25 July 1827 (206) | *1276 | 1 Sun. | 31 July 1859 (212) | 1309 | 6 Fri. | 7 Aug. 1891 (219) |
| 1244 | 2 Mon. | 14 July 1828* (196) | 1277 | 6 Fri. | 20 July 1860* (202) | 1310 | 3 Tues. | 26 July 1892* (208) |
| 1245 | 6 Fri. | 3 July 1829 (184) | *1278 | 3 Tues. | 9 July 1861 (190) | *1311 | 0 Sat. | 15 July 1893 (196) |
| *1246 | 3 Tues. | 22 June 1830 (173) | 1279 | 1 Sun. | 29 June 1862 (180) | 1312 | 5 Thurs. | 5 July 1894 (186) |
| 1247 | 1 Sun. | 12 June 1831 (163) | 1280 | 5 Thurs. | 18 June 1863 (169) | 1313 | 2 Mon. | 24 June 1895 (175) |
| *1248 | 5 Thurs. | 31 May 1832* (152) | *1281 | 2 Mon. | 6 June 1864* (158) | *1314 | 6 Fri. | 12 June 1896* (164) |
| 1249 | 3 Tues. | 21 May 1833 (141) | 1282 | 0 Sat. | 27 May 1865 (147) | 1315 | 4 Wed. | 2 June 1897 (153) |
| 1250 | 0 Sat. | 10 May 1834 (130) | 1283 | 4 Wed. | 16 May 1866 (136) | *1316 | 1 Sun. | 22 May 1898 (142) |
| *1251 | 4 Wed. | 29 Apr. 1835 (119) | *1284 | 1 Sun. | 5 May 1867 (125) | 1317 | 6 Fri. | 12 May 1899 (132) |
| 1252 | 2 Mon. | 18 Apr. 1836* (109) | 1285 | 6 Fri. | 24 Apr. 1868* (115) | 1318 | 3 Tues. | 1 May 1900 (121) |
| 1253 | 6 Fri. | 7 Apr. 1837 (97) | *1286 | 3 Tues. | 13 Apr. 1869 (103) | | | |
| *1254 | 3 Tues. | 27 Mar. 1838 (86) | 1287 | 1 Sun. | 3 Apr. 1870 (93) | | | |

# APPENDIX.

# ECLIPSES OF THE SUN IN INDIA.[1]

By Dr. Robert Schram.

A complete list of all eclipses of the sun for any part of the globe between the years 1200 B.C. and 2160 A.D. has been published by Oppolzer in his "Canon der Finsternisse", *(Denkschriften der mathematisch naturwissenschaftlichen Classe der Kais. Akademie der Wissenschaften in Wien, Vol. LII. 1887)*. In this work are given for every eclipse all the data necessary for the calculation of the path of the shadow on the earth's surface, and of its beginning, greatest phase, and end for any particular place. But inasmuch as the problem is a complicated one the calculations required are also unavoidably complicated. It takes considerable time to work out by the exact formulæ the time of the greatest phase of a given eclipse for a particular place, and when, as is often the case with Indian inscriptions, we are not sure of the year in which a reported eclipse has taken place, and it is therefore necessary to calculate for a large number of eclipses, the work becomes almost impossible.

The use, however, of the exact formulæ is seldom necessary. In most cases it is sufficient to make use of a close approximation, or still better of tables based on approximate formulæ.

Such tables I have published under the title "Tafeln zur Berechnung der naheren Umstande der Sonnenfinsternisse", *(Denkschriften der mathematisch naturwissenschaftlichen Classe der Kais. Akademie der Wissenschaften in Wien, Vol. LI. 1886)* and the Tables B, C, and D, now given are based on those. That is to say, they contain extracts from those tables, somewhat modified and containing only what is of interest for the continent of India. Table A is a modified extract from Oppolzer's *Canon*, containing only eclipses visible in India and the immediate neighbourhood. All others are eliminated, and thus the work of calculation is greatly diminished, as no other eclipses need be examined to ascertain their visibility at the given place.

Oppolzer's *Canon* gives the following elements:

Date of eclipse and Greenwich mean civil time of conjunction in longitude.

$L'$ = longitude of Sun and Moon, which is of course identical at the middle of the eclipse.

$Z$ = Equation of time in degrees.

$\varepsilon$ = Obliquity of the ecliptic.

$\left.\begin{matrix} P \\ \log p \end{matrix}\right\}$ $p \sin P$ being equal to $\frac{\sin (b-b')}{\sin (\pi-\pi')}$; where $b$ and $b'$ denote the moon's and sun's latitude, $\pi$ and $\pi'$ their respective parallaxes.

$\left.\begin{matrix} Q \\ \log q \end{matrix}\right\}$ $q \cos Q$ being the hourly motion of $p \sin P$.

$\log \Delta L$ = the hourly motion of $\frac{\cos b \sin (L-L')}{\sin (\pi-\pi')}$ where $L$ denotes the moon's, $L'$ the sun's longitude.

[1] I propose to publish, either in a second edition of this work, if such should be called for, or in one of the scientific periodicals, tables of lunar eclipses, computed from Oppolzer's *Canon der Finsternisse*, and containing those visible in India during the period comprised in the present volume. [R. S.]

$u'_s$ = radius of shadow.

$f_s$ = angle of shadow's cone.

$\gamma$ = shortest distance of shadow's centre from earth's centre.

$\mu$ = Sun's hour-angle at Greenwich at the moment of this shortest distance.

$\log n$ = hourly motion of shadow's centre.

$\log \sin \delta'$ / $\log \cos \delta'$ Sun's declination.

$N'$ = angle of moon's orbit with declination circle ($N' = N - h$, where $N$ is the angle of the moon's orbit with latitude circle, and $\tan h = \cos L' \cos \varepsilon$.

| | |
|---|---|
| $G$ | $\sin g \sin G = \sin \delta' \sin N'$. |
| $K$ | $\sin g \cos G = \cos N'$. |
| $\sin g$ | $\cos g = \cos \delta' \sin N'$. |
| $\sin k$ | $\sin k \sin K = \sin N'$. |
| $\cos g$ | $\sin k \cos K = \sin \delta' \cos N'$. |
| $\cos k$ | $\cos k = \cos \delta' \cos N'$. |

With these elements the calculation of the moment of greatest phase of eclipse at a given place, whose longitude from Greenwich is $\lambda$ and whose latitude is $\phi$, is found by the formulæ:

$$\log \phi_1 = 0{,}9966 \log \phi.$$

$$m \sin M = \gamma - 0{,}9966 \cos g \sin \phi_1 + \cos \phi_1 \sin g \sin (G + t_0).$$

$$m \cos M = (t_0 - \lambda - \mu) \frac{n}{15} - 0{,}9966 \sin \phi_1 \cos k + \cos \phi_1 \sin k \cos (K + t_0).$$

$$m' \sin M' = -0{,}2618 \cos \phi_1 \sin g \cos (G + t_0).$$

$$m' \cos M' = n - 0{,}2618 \cos \phi_1 \sin k \sin (K + t_0).$$

$$t_1 = t_0 - 15 \frac{m}{m'} \cos (M + M').$$

Making firstly $t_0 = \lambda + \mu$, this formulæ gives the value of $t_1$. This value is put in the formulæ instead of $t_0$ and the calculation repeated, and thus we get a closer value for $t$; which, again put in the place of $t_0$, gives a second corrected value of $t$. Calculation by these formulæ must be repeated as long as the new value of $t$ differs from the former one, but, as a general rule, three or four times suffices. The last value of $t$ is then the hour-angle of the sun at the given place for the moment of greatest phase at that place. With the last value of $m$ we find the magnitude of the greatest phase at the given place in digits $= 6 \frac{u'_s - m}{u'_s - 0{,}2736}$.

These calculations are, as will be seen, very complicated, and for other than astronomical problems it is hardly ever necessary to attain to so great a degree of accuracy. For ordinary purposes they may be greatly simplified, as it suffices to merely fix the hour-angle to the nearest degree.

The angle $N$ is very nearly constant, its mean value being $N = 84°3$ or $N = 95°7$ according as the moon is in the ascending or descending node. Which of these is the case is always shown by the value of $P$, as $P$ is always near 0° when the moon is in the ascending, and near 180° when she is in the descending node. Taking also for $\varepsilon$ a mean value, say $\varepsilon = 23°60$, and making the calculations separately for the cases of the ascending and descending node, we find that $\delta'$, $h$, $N'$, $\sin g$, $\cos g$, $\sin k$, $\cos k$, $G$ and $K$ are all dependents of $L'$, and can therefore be tabulated for single values of $L'$, say from 10 to 10 degrees.

The second of the above formulæ

$$m \cos M = (t_0 - \lambda - \mu) \frac{n}{15} - 0{,}9966 \sin \phi_1 \cos k + \cos \phi_1 \sin k \cos (K + t_0)$$

will give for $t$ the value

$$t = (\lambda + \mu) + \frac{15}{n} \times 0{,}9966 \sin \phi_1 \cos k - \frac{15}{n} \cos \phi_1 \sin k \cos (K + t) + \frac{15}{n} m \cos M.$$

The angle M being, at the moment of greatest phase, always sufficiently near 90° or 270°, $\frac{15}{n} m \cos M$ can be neglected; and, introducing for $\frac{15}{n}$ its mean value 27.544, and identifying $\phi_1$ with $\phi$, the value of t, can simply be determined by the expression

$$t = (\lambda + \mu) + 27{,}447 \sin \phi \cos k - 27.544 \cos \phi \sin k \cos (K + t)$$

instead of determining it by the whole of the above formulæ. Now in this last expression k and K are mere dependents on L', and therefore the values of t can be tabulated for each value of L' with the two arguments $\lambda + \mu$ and $\phi$. Table D is constructed on this formula, only instead of counting t in degrees and from true noon it is counted, for Indian purposes, in ghaṭikâs and their tenths from true sunrise.

The value of t for the instant of the greatest phase at the given place being found, it can be introduced into the formula

$$m \sin M = \gamma - 0{,}9966 \cos g \sin \phi_1 + \cos \phi_1 \sin g \sin (G + t).$$

As M is always near 90° or 270°, sin M can be considered equal to $\pm 1$, so we have

$$\pm m = \gamma - 0{,}9966 \cos g \sin \phi + \cos \phi \sin g \sin (G + t)$$

where the sign $\pm$ is to be selected so that the value of m may always be positive.

The second part of the above expression

$$- 0{,}9966 \cos g \sin\phi + \cos\phi \sin g \sin(G + t)$$

(which, for the sake of brevity, may be called by the letter $\Gamma''$) contains only values which directly depend on L', such as cos g, sin g, G, or which, for a given value of L', depend only on $\lambda + \mu$ and $\phi$, and therefore the values of $\Gamma'$ can be tabulated for each value of L' with the two arguments $\lambda + \mu$ and $\phi$. This has been done in the Table B which follows, but instead of $\Gamma'$ the value $1 + \Gamma'' = \Gamma$ has been tabulated to avoid negative numbers. The value of m can then be found from

$$m = \pm (\gamma + \Gamma'').$$

Both Tables B and D ought to consist of two separate tables, one containing the values of L' from 0° to 360° in the case of P being near 0°, the other containing the values of L' from 0° to 360° for the case of P being near 180°. To avoid this division into two tables, and the trouble of having always to remember whether P is near 0° or 180°, the two tables are combined into one single one; but, whilst in the case of P being near 0° L' is given as argument, in the case of P being near 180° the table contains, instead of L', L' + 400° as argument. We need therefore no longer care whether the moon is in the ascending or descending node, but simply take the argument as given in the first table.

With the value of m, found by $m = \pm (\gamma + \Gamma'')$, we can find the magnitude of the greatest phase in digits $= 6 \frac{u'_a - m}{u'_a - 0.2723}$, which formula can also be tabulated with the arguments $u'_a$ and m, or with $u'_a$ and $(\gamma + \Gamma)$. This has been done in Table C. As $u'_a$ when abbreviated to two places of decimals has only the six values 0.53, 0.54, 0.55, 0.56, 0.57 and 0.58, every column of this Table is calculated for another value of $u'_a$, whilst to $\gamma$ the constant 5 has been added so that all values in the first Table may be positive. Instead of giving $u'_a$ directly, its last cipher is given as tenths to the value of $(\gamma + \Gamma)$ so that there is no need for ascertaining the value of $u'_a$.

Of all elements, then, given by the *Canon* we want only the following ones:—

Date of eclipse, and Greenwich mean time of conjunction in longitude

$L'$ = longitude of sun and moon.

$P$ (only indication if $P$ is near 0° or near 180°).

$u'_s$ = radius of shadow.

$\gamma$ = shortest distance of shadow's centre from earth's centre.

$\mu$ = Sun's hour-angle at Greenwich at the moment of this shortest distance.

(There is no necessity for attempting any further explanation of all the other elements and formulæ noted above, which would be impossible without going into the whole theory of eclipses. Such an attempt is not called for in a work of this kind.)

These elements are given in Table A in the following form:—

Column 1. Date of eclipse,—year, month, and day; Old Style till 2 September, 1752 A.D., New Style from 14 September, 1752.

Column 2. Lanka time of conjunction in longitude, counted from mean sunrise in hours and minutes.

Column 3. L = longitude of sun and moon in degrees, when P is near 0°; or longitude of sun and moon plus 400°, when P is near 180°; so that numbers in this column under 360° give directly the value of this longitude, and indicate that P is near 0°, or that the moon is in the ascending node, whilst numbers over 400° must be diminished by 400 when it is desired to ascertain this longitude. At the same time these last indicate that P is near 180°, that is that the moon is in the descending node.

Column 4. $\mu$ = Sun's hour-angle at Greenwich at the moment of shortest distance of shadow's centre from earth.

Column 5. $\gamma'$ = ten times the second decimal cipher of $u'_s + 5 + \gamma$. So the tenths of the numbers of this column give the last cipher of $u'_s$, whose first ciphers are 0.5, and the rest of the number diminished by 5 gives the value of $\gamma$.

For instance; the line 975 II 14. 0 h 52 m. 730°, 202°, 74.66 shows that on the 14th February, A.D. 975, the conjunction took place at 0 h 52 m after mean Lanka sunrise, that the longitude of sun and moon was 330° (the moon in the descending node), $\mu = 202°$, $u'_s = 0{,}57$, and $\gamma = -0{,}34$.

**Use of the Tables.**

Table A gives, in the first column, the year, month, and day of all eclipses visible in any part of India, or quite close to the frontiers of India. The frontiers are purposely taken on rather too large a scale, but this is a fault on the right side. The letters appended shew the kind of eclipse; "a" stands for annular, "t" for total, "p" for partial. Eclipses of the last kind are visible only as very slight ones in India and are therefore not of much importance.[1] When the letter is in brackets the meaning is that the eclipse was only visible quite on the frontiers or even beyond them, and was without importance. When the letter is marked with an asterisk it shews that the eclipse was either total or annular in India or close to it, and is therefore one of greater importance. The second column shews, in hours and minutes counted from mean sunrise at Lanka, the time of conjunction in longitude. This column serves only as an indication as to whether the eclipse took place in the morning or afternoon; for the period of the greatest phase at any particular place may differ very sensibly from the time thus given, and must in every case be determined from Table D, if required. The third, fourth, and fifth columns, headed respectively L, $\mu$, and $\gamma'$, furnish the arguments for the following Tables B, C, and D, by which can be found the magnitude and the moment of the greatest phase of the eclipse at a particular place.

[1] But see Art. 40a, p. 23, paragraph 2, Professor Jacobi's remarks on eclipses mentioned in Indian inscriptions. [R. S.]

Table B (as well as Table D) consists of seventy-two different Tables, each of which is calculated for a particular value of L taken in tens of degrees. Each of these little tables is a table with a double argument, giving the value of $\gamma''$. The arguments are, vertically the latitude $\Phi$, and horizontally the longitude $\lambda$ of the given place, the latter being stated in degrees from Greenwich and augmented by the value of $\mu$ given in Table A. The reader selects that table which is nearest to the value of L given by Table A, and determines from it, by interpolation with the arguments $\Phi$ and $\lambda+\mu$, the value of $\gamma''$. If a greater degree of accuracy is desired, it is necessary to determine, with the arguments $\Phi$ and $\lambda+\mu$, the value of $\gamma''$ by both tables preceding and following the given value of L., and to interpolate between the two values of $\gamma''$ so found.

The final value of $\gamma''$ is added to the value of $\gamma'$ given by Table A, and this value of $\gamma' + \gamma''$ serves as argument for Table C, which gives directly the magnitude of the greatest phase at the given place in digits, or twelfths of the sun's diameter.

Table D is arranged just like Table B, and gives, with the arguments $\Phi$ and $\lambda+\mu$, the moment of the greatest phase at the given place in ghaṭikâs and their tenths, counted from true sunrise at the given place.

The first value in each line of Tables B and D corresponds to a moment before sunrise and the last value in each line to a moment after sunset. Both values are given only for purposes of interpolation. Therefore in both cases the *greatest phase* is invisible when $\lambda + \mu$ coincides exactly with the first or last value of the line, and still more so when it is less than the first or greater than the last value. But in both cases, when the difference between $\lambda + \mu$ and the last value given does not exceed 15 degrees, it is possible that in the given place the *end* of the eclipse might have been visible after sunrise, or the *beginning* of the eclipse before sunset. As the tables give only the time for the greatest phase this question must be decided by direct calculation.

## EXAMPLES.

EXAMPLE 1. Was the eclipse of the 20th June, A.D. 540, visible at Jâlna, whose latitude $\Phi$, is 19° 48′ N., and whose longitude, $\lambda$, is 75° 54′ E.?

Table A gives: 540 VI 20, 7 h 57 m  L = 490  $\mu = 314°$  $\gamma' = 35.34$

Jâlna has $\Phi = 20°$, and . . . . . . . . . . . . . . . . . $\lambda = 76°$

$\lambda+\mu = 30°$

Table B. L = 490 gives, with $\Phi = 20°$ and $\lambda + \mu = 30°$, . . . . . . . . . $\gamma'' = 0{,}86$

$\gamma'+\gamma'' = 36{,}20$

Table C gives, with $\gamma'$ $\gamma'' = 36{,}20$, the magnitude of the greatest phase as nearly 8 digits.

Table D. L = 490 gives, with $\Phi = 20°$ and $\lambda+\mu = 30°$, for the moment of the greatest phase, 24.8 ghaṭikâs or 24 gh. 48 pa. after true sunrise at Jâlna.

EXAMPLE 2. Was the same eclipse visible at Multân, whose latitude $\Phi$ is 30° 13′ N., and whose longitude, $\lambda$, is 71° 26′ E.?

Table A gives: A.D. 540 VI 20, 7 h.57 m. L = 490. $\mu = 314°$  $\gamma' = 35.34$

Multan has $\Phi = 30°$ and . . . . . . . . . . . . $\lambda = 71°$

$\lambda + \mu = 25°$

Table B. L = 490 gives, with $\Phi = 30°$ and $\lambda + \mu = 25°$. . . . . $\gamma'' = 0{,}76$ (diff. between 0.80 and 0.72)

$\gamma' + \gamma'' = 36{,}10$

Table C gives, with $\gamma' + \gamma'' = 36{,}10$, the magnitude of the greatest phase as exactly 10 digits.

Table D. L = 490 gives, with $\phi = 30°$ and $\lambda + \mu = 25°$, for the moment of the greatest phase, 24,0 ghaṭikâs, or 24 gh. 0 pa. after true sunrise at Multân.

EXAMPLE 3. Was the eclipse of the 7th June, A.D. 913, visible at Trivandrum, whose latitude, $\phi$, is 8° 30′ N., and longitude, $\lambda$, 76° 56′ E.?

| | | | |
|---|---|---|---|
| Table A gives: 913 VI 7, 8 h. 35 m. | L = 480 | $\mu = 323°$ | $\gamma' = 44{,}98$ |
| Trivandrum has, $\phi = 8°$ and . . . . . . . . . . . . . . | | $\lambda = 77°$ | |
| | | $\lambda + \mu = 40°$ | |
| Table B. L = 480 gives, with $\phi = 8°$ and $\lambda + \mu = 40°$, . . . . . . . . . . . | | | $\gamma'' = 1{,}02$ |
| | | | $\gamma' + \gamma'' = 46{,}00$ |

Table C shews, with $\gamma' + \gamma'' = 46{.}00$, that the eclipse was total at Trivandrum.

Table D. L = 480 gives, with $\phi = 8°$ and $\lambda + \mu = 40$, for the moment of totality 26,2 ghaṭikâs or 26 gh. 12 pa. after true sunrise at Trivandrum.

EXAMPLE 4. Was the same eclipse visible at Lahore whose latitude, $\phi$, is 31° 33′ N., and longitude, $\lambda$, 74° 16′ E.?

| | | | |
|---|---|---|---|
| Table A gives: 913 VI 7, 8 h. 35 m. | L = 480 | $\mu = 323°$ | $\gamma' = 44{,}98$ |
| Lahore has $\phi = 32°$ and . . . . . . . . . . . . . . . . | | $\lambda = 74°$ | |
| | | $\lambda + \mu = 37°$ | |
| Table B. L = 480 gives, with $\phi = 32°$ and $\lambda + \mu = 37°$, . . . . . . . . . . . | | | $\gamma'' = 0{,}69$ |
| | | | $\gamma' + \gamma'' = 45{,}67$ |

Table C gives, with $\gamma' + \gamma'' = 45{,}67$, the magnitude of the greatest phase 4,8 digits.

Table D. L = 480 gives, with $\phi = 32°$ and $\lambda + \mu = 37°$, for the moment of the greatest phase 26,9 ghaṭikâs, or 26 gh. 54 pa. after true sunrise at Lahore.

In all these examples the value of L (Table A) was divisible by 10, and therefore a special table for this value was found in Table B. When the value of L is not divisible by 10, as will mostly be the case, there is no special table exactly fitting the given value. In such a case we may take the small table in Table B for the value of L nearest to that given. Thus for instance, if L is 233 we may work by the table L = 230, or when L is 487 we may work by the Table L = 490 and proceed as before, but the result will not be very accurate. The better course is to take the value of $\gamma''$ from both the table next preceding and the table next following the given value of L, and to fix a value of $\gamma''$ between the two.[1] Thus for L = 233 we take the value of $\gamma''$ both from Table 230 and from Table 240 and fix its truer value from the two. But where the only question is whether an eclipse was visible at a given place and there is no necessity to ascertain its magnitude, the first process is sufficient.

EXAMPLE 5. Was the eclipse of the 15 January, A.D. 1032, visible at Karâchi, whose latitude, $\phi$, is 24° 53′ N., and longitude, $\lambda$, 66° 57′ E.?

| | | | |
|---|---|---|---|
| Table A gives 1032 I 15, 10 h. 1 m. | L = 701 | $\mu = 342°$ | $\gamma' = 45{,}46$ |
| Karâchi has $\phi = 25°$, and . . . . . . . . . . . . . . | | $\lambda + 67°$ | |
| | | $\lambda + \mu = 49°$ | |
| Table B. L = 700 gives, with $\phi = 25°$ and $\lambda + \mu = 49°$ . . . $\gamma'' = 0{,}63$ } | | | |
| Table B. L = 710 " " " " " " . . . $\gamma'' = 0{,}69$ } or[1] for L 701 . . | | | $\gamma'' = 0{,}64$ |
| | | | $\gamma' + \gamma'' = 46{,}10$ |

[1] Here the auxiliary table to Tables VI. and VII. above may be used. [R. S.]

Table C gives, with $\gamma' + \gamma'' = 46{,}10$, the magnitude of the greatest phase as 10,0 digits.

Table D. L 700 gives, with $\phi = 25$ and $\lambda + \mu = 49°$, .... 25,7 }
Table D. L 710 „ „ „ „ „ „ ..... 26,0 } or for L 701, for the moment of the greatest phase, 25,7 ghaṭikâs, or 25 gh. 42 pa. after true sunrise at Karâchi.

EXAMPLE 6. Was the same eclipse visible at Calcutta, whose latitude, $\phi$, is 22° 36′ N., and longitude, $\lambda$, 88° 23′ E.?

Table A gives 1032 I 15, 10 h. 1 m. L = 701 $\mu = 342°$ $\gamma' = 45{,}56$
Calcutta has $\phi = 23°$, and . . . . . . . . . . . . . . . $\lambda = 88°$

$\lambda + \mu = 70°$

$\lambda + \mu$ is *greater* than the arguments for which values are given in Table B, 700 and 710. This indicates that the greatest phase of the eclipse takes place *after sunset* and is therefore invisible.[1]

EXAMPLE. 7. Was the eclipse of the 31st. December, A.D. 1358, visible at Dhaka, whose latitude, $\phi$, is 23° 45′ N., and longitude, $\lambda$, 90° 23′ E.?

Table A gives: 1358 XII 31, 1 h. 28 m. L = 288 $\mu = 213°$ $\gamma' = 45{,}48$
Dhaka has $\phi = 24°$, and . . . . . . . . . . . . . . . . . $\lambda = 90°$

$\lambda + \mu = 303°$

Table B. L 280 gives, with $\phi = 24°$ and $\lambda + \mu$ 303°, .. $\gamma'' = 0{,}42$ }
Table B. L 290 „ „ „ „ „ „ „ $\gamma'' = 0{,}35$ }, or for L 288 ... $\gamma'' = 0{,}36$

$\gamma' + \gamma'' = 45{,}84$

Table C gives, with $\gamma' + \gamma'' = 45{,}84$, the magnitude of the greatest phase as 8,5 digits.

Table D. L 280 gives, with $\phi = 24°$ and $\lambda + \mu = 303°$, .. 0,0 }
Table D. L 290 „ „ „ „ „ „ ... 0,2 }, or for L 288, for the moment of the greatest phase 0,2 ghaṭikâs, or 0 gh. 12 pa. after true sunrise at Dhaka.

EXAMPLE 8. Was the same eclipse visible at Bombay whose latitude, $\phi$, is 18° 57′ N., and longitude, $\lambda$, 72° 51′ E.?

Table A gives: 1358 XII 31, 1 h. 28 m. L = 288° $\mu = 213°$ $\gamma' = 45{,}48$
Bombay has $\phi = 19°$ . . . . . . . . . . . . . . . . . . $\lambda = 73°$

$\lambda + \mu = 286°$

$\lambda + \mu$ is *less* than the arguments for which there are values given in Table B 280 and B 290. This indicates that the greatest phase of the eclipse took place *before sunrise* and was therefore invisible.[2]

EXAMPLE 9. Was the eclipse of the 7th June, A.D. 1415, visible at Śrînagar, whose latitude, $\phi$, is 34° 6′ N., and longitude, $\lambda$, = 74° 55′ E.?

Table A gives: 1415 VI 7, 6 h. 14 m. L = 484 $\mu = 289°$ $\gamma' = 35{,}58$
Srinagar has $\phi = 34°$, and . . . . . . . . . . . . . . . . $\lambda = 75°$

$\lambda + \mu = 4°$

Table B 480 gives, with $\phi = 34°$ and $\lambda + \mu = 4°$, .... $\gamma'' = 0{,}81$ }
Table B 490 „ „ „ „ „ „ „ .... $\gamma'' = 0{,}82$ }, or for L 484 .. $\gamma'' = 0{,}81$

$\gamma' + \gamma'' = 36{,}39$

Table C gives, with $\gamma' + \gamma'' = 36{,}39$, the magnitude of the greatest phase as 3,3 digits.

[1] For the visibility of the *beginning* of the eclipse see page 111.
[2] For the visibility of the *end* of the eclipse see page 111.

Table D 480 gives, with $\phi = 34°$ and $\lambda + \mu = 4°, \ldots 18{,}8$ }, or for L 484, for the moment
Table D 490 " " " " " " " ... 18,9 }
of the greatest phase 18,8 ghaṭikâs, or 18 gh. 48 pa. after true sunrise at Śrinagar.

EXAMPLE 10. Was the same eclipse visible at Madras, whose latitude, $\phi$, = 13° 5′ N., and longitude, $\lambda$, 80° 17′ E.?

Table A gives: 1415 VI 7. 6 h. 14 m. L = 484 $\mu = 289°$ $\gamma' = 35{,}58$
Madras has $\phi = 13°$, and . . . . . . . . . . . . . . . $\lambda = 80°$
$\lambda + \mu = 9°$

Table B. L 480 gives, with $\phi = 13°$ and $\lambda + \mu = 9°, \ldots \gamma'' = 1{,}15$ }, or for L 484 . . . $\gamma'' = 1{,}14$
Table B. L 490 " " " " " " " ... $\gamma'' = 1{,}14$ }
$\gamma' + \gamma'' = 36{,}72$

$\gamma' + \gamma''$ is greater than the values contained in Table C.

This indicates that Madras is too much to the south to see the eclipse.

EXAMPLE 11. Was the eclipse of the 20th August, A.D. 1495, visible at Madras, whose latitude, $\phi$, is 13° 5′ N., and longitude, $\lambda$, 80° 17′ E.?

Table A gives: 1495 VIII 20. 4 h. 55 m L = 155 $\mu = 269°$ $\gamma' = 54{,}62$
Madras has $\phi = 13°$ and . . . . . . . . . . . . . . . $\lambda = 80°$
$\lambda + \mu = 349°$

Table B. L 150 gives, with $\phi = 13°$ and $\lambda + \mu = 349°$, $\gamma'' = 1{,}05$ }, or for L 155 . . . $\gamma'' = 1{,}03$
Table B. L 160 " " " " " " $\gamma'' = 1{,}01$ }
$\gamma' + \gamma'' = 55{,}65$

Table C gives, with $\gamma' + \gamma'' = 55{,}65$, the magnitude of the greatest phase as 4.4 digits.
Table D. L 150 gives, with $\phi = 13°$ and $\gamma + \mu = 349°$; . . 12,1 } or for L 155, for the greatest
Table D. L 160 " " " " " " . . 11,8 }
phase 12.0 ghaṭikâs, or 12 gh. 0 pa. after true sunrise at Madras.

EXAMPLE 12. Was the same eclipse visible at Śrinagar whose latitude, $\phi$, = 34° 6′ N., and longitude, $\lambda$, 74° 55′ E.?

Table A gives: 1495 VIII 20, 4 h. 55 m. L = 155 $\mu = 269°$ $\gamma' = 54{,}62$
Śrinagar has $\phi = 34°$ . . . . . . . . . . . . . . . . $\lambda = 75°$
$\lambda + \mu = 344°$

Table B. L 150 gives, with $\phi = 34°$ and $\gamma + \mu = 344°$, $\gamma'' = 0{,}72$ }, or for L 155 . . $\gamma'' = 0{,}71$
Table B. L 160 " " " " . . . . . . $\gamma'' = 0{,}69$ }
$\gamma' + \gamma'' = 55{,}33$

$\gamma' + \gamma''$ is less than the values contained in Table C.

This indicates that Śrinagar is too much to the north to see the eclipse.

It was intended that these tables should be accompanied by maps shewing the centre-lines, across the continent of India, of all eclipses of the sun between A.D. 300 and 1900, but it has not been found possible to complete them in time, owing to the numerous calculations that have to be made in order that the path of the shadow may be exactly marked in each case. Such maps would plainly be of considerable value as a first approximation, and I hope to be able soon to publish them separately.

Vienna, November, 1895. R. SCHRAM.

# TABLE A.

| Date A. D. | Lanka time of conjunction measured from sunrise. | | L | μ | γ'. | |
|---|---|---|---|---|---|---|
| 301 IV 25 | 6 h. | 6 m. | 434 | 288 | 45.46 | t* |
| 304 II 22 | 7 | 12 | 733 | 301 | 76.19 | p |
| 305 VIII 7 | 4 | 19 | 134 | 250 | 64.72 | a* |
| 306 I 31 | 2 | 4 | 712 | 220 | 44.62 | (t) |
| 306 VII 27 | 6 | 26 | 123 | 288 | 75.47 | a |
| 307 VI 5 | 4 | 30 | 74 | 265 | 44.27 | t |
| 308 XI 29 | 23 | 27 | 649 | 189 | 75.36 | (a) |
| 310 XI 8 | 0 | 12 | 626 | 198 | 74.01 | (a) |
| 313 IX 7 | 4 | 44 | 564 | 265 | 44.69 | t |
| 314 III 2 | 23 | 49 | 343 | 185 | 56.06 | p |
| 316 VII 6 | 3 | 48 | 503 | 252 | 65.24 | a* |
| 316 XII 31 | 6 | 18 | 281 | 285 | 55.41 | a* |
| 320 IV 25 | 1 | 40 | 435 | 219 | 54.76 | a |
| 320 X 18 | 6 | 57 | 206 | 301 | 45.23 | t |
| 324 II 11 | 10 | 32 | 723 | 347 | 44.64 | t |
| 325 XII 22 | 3 | 18 | 671 | 246 | 66.08 | p |
| 326 XII 11 | 7 | 37 | 660 | 310 | 75.37 | a |
| 327 VI 6 | 4 | 2 | 74 | 256 | 34.96 | t* |
| 329 X 9 | 5 | 38 | 596 | 284 | 46.12 | p |
| 331 III 25 | 2 | 16 | 4 | 226 | 75.29 | a |
| 332 III 13 | 7 | 29 | 353 | 301 | 56.01 | (p) |
| 333 II 1 | 9 | 41 | 313 | 338 | 44.02 | (t) |
| 333 VII 28 | 8 | 18 | 525 | 321 | 76.09 | p |
| 334 I 22 | 1 | 47 | 303 | 218 | 44.70 | (t) |
| 334 VII 17 | 10 | 38 | 514 | 354 | 65.31 | a |
| 338 V 6 | 8 | 41 | 445 | 325 | 54.83 | a* |
| 339 X 19 | 7 | 4 | 206 | 301 | 45.89 | t |
| 341 III 4 | 5 | 11 | 744 | 269 | 55.46 | t* |
| 346 VI 4 | 4 | 38 | 73 | 263 | 45.64 | t |
| 348 IV 15 | 8 | 33 | 26 | 324 | 74.47 | a |
| 348 X 9 | 6 | 16 | 597 | 292 | 45.45 | t* |
| 349 IV 4 | 9 | 14 | 15 | 331 | 65.22 | a* |
| 352 II 2 | 10 | 22 | 314 | 346 | 44.68 | t* |
| 353 VII 17 | 3 | 13 | 514 | 241 | 44.61 | t |
| 354 I 11 | 5 | 9 | 292 | 265 | 76.14 | p |
| 355 V 28 | 4 | 15 | 466 | 261 | 45.68 | t |
| 356 XI 9 | 0 | 18 | 228 | 201 | 45.22 | t |
| 358 III 26 | 5 | 11 | 406 | 274 | 66.23 | (p) |
| 359 IX 9 | 2 | 3 | 166 | 227 | 64.55 | a |
| 360 III 4 | 3 | 5 | 744 | 236 | 44.70 | (t) |
| 360 VIII 28 | 2 | 59 | 155 | 238 | 75.28 | a* |

| Date A. D. | Lanka time of conjunction measured from sunrise. | | L. | μ | γ'. | |
|---|---|---|---|---|---|---|
| 361 VIII 17 | 4 h. | 12 m. | 144 | 254 | 66.00 | a |
| 363 I 1 | 23 | 52 | 682 | 191 | 75.38 | a |
| 364 VI 16 | 11 | 58 | 85 | 13 | 45.57 | t |
| 365 VI 6 | 0 | 46 | 75 | 203 | 56.38 | (p) |
| 367 X 10 | 5 | 15 | 597 | 275 | 54.77 | t |
| 368 IV 3 | 22 | 27 | 15 | 168 | 55.90 | a |
| 370 VIII 8 | 0 | 40 | 535 | 205 | 65.45 | a |
| 371 II 2 | 7 | 32 | 314 | 302 | 55.38 | a* |
| 372 VII 17 | 2 | 23 | 514 | 227 | 33.96 | (p) |
| 373 VI 7 | 11 | 32 | 476 | 10 | 45.73 | t |
| 374 XI 20 | 9 | 6 | 239 | 333 | 45.21 | t |
| 375 XI 10 | 0 | 38 | 228 | 205 | 45.87 | t |
| 378 IX 8 | 10 | 6 | 166 | 346 | 75.23 | a |
| 379 VIII 28 | 11 | 27 | 155 | 3 | 65.94 | a |
| 380 I 24 | 4 | 28 | 705 | 260 | 66.97 | p |
| 381 I 12 | 7 | 52 | 694 | 310 | 75.49 | a* |
| 381 VII 8 | 2 | 32 | 106 | 232 | 34.74 | t |
| 382 I 1 | 7 | 6 | 682 | 298 | 74.71 | a |
| 383 XI 11 | 7 | 43 | 630 | 316 | 46.15 | p |
| 385 IV 25 | 22 | 52 | 36 | 178 | 65.08 | a |
| 386 IV 15 | 5 | 47 | 25 | 279 | 55.83 | t |
| 387 III 6 | 10 | 47 | 346 | 355 | 43.94 | (p) |
| 388 VIII 18 | 7 | 55 | 546 | 314 | 65.51 | a* |
| 392 VI 7 | 5 | 14 | 476 | 274 | 55.07 | a* |
| 393 V 27 | 8 | 38 | 466 | 323 | 74.29 | (a) |
| 393 XI 20 | 9 | 30 | 239 | 337 | 45.87 | t |
| 395 IV 6 | 4 | 12 | 416 | 258 | 45.54 | t* |
| 399 VII 19 | 10 | 9 | 116 | 346 | 34.68 | (t) |
| 400 VII 8 | 2 | 43 | 106 | 233 | 45.42 | t* |
| 402 V 18 | 4 | 5 | 57 | 259 | 74.23 | (a) |
| 402 XI 11 | 8 | 26 | 630 | 325 | 45.49 | t |
| 403 V 7 | 5 | 34 | 46 | 279 | 65.00 | a* |
| 407 II 23 | 23 | 40 | 346 | 184 | 55.32 | a |
| 407 VIII 19 | 1 | 54 | 546 | 222 | 44.79 | t* |
| 408 II 13 | 4 | 44 | 325 | 258 | 76.09 | p |
| 409 VI 29 | 2 | 1 | 497 | 227 | 45.91 | (t) |
| 410 VI 18 | 11 | 59 | 487 | 15 | 65.16 | a |
| 410 XII 12 | 2 | 49 | 262 | 236 | 45.21 | t |
| 413 X 11 | 0 | 55 | 199 | 213 | 74.45 | a |
| 414 IV 6 | 2 | 59 | 417 | 238 | 34.85 | t |
| 414 IX 30 | 0 | 52 | 187 | 209 | 75.15 | a |

| Date A. D. | Lanka time of conjunction measured from sunrise. | | L | μ | γ'. | |
|---|---|---|---|---|---|---|
| 415 IX 19 | 2 h. | 27 m. | 176 | 230 | 65.85 | a |
| 418 VII 19 | 10 | 8 | 116 | 344 | 45.35 | t* |
| 419 XII 8 | 1 | 29 | 652 | 221 | 46.15 | (p) |
| 421 XI 11 | 6 | 41 | 639 | 297 | 54.81 | (a) |
| 425 III 6 | 7 | 29 | 347 | 302 | 55.29 | a* |
| 425 VIII 29 | 9 | 45 | 556 | 340 | 44.84 | (t) |
| 426 VIII 19 | 1 | 43 | 546 | 217 | 34.14 | t |
| 427 VII 10 | 9 | 16 | 508 | 335 | 45.98 | t |
| 429 XII 12 | 3 | 23 | 262 | 243 | 45.87 | t |
| 432 IV 16 | 10 | 44 | 427 | 355 | 34.91 | t |
| 432 X 10 | 8 | 23 | 198 | 324 | 75.12 | a |
| 433 IX 29 | 10 | 12 | 187 | 347 | 65.82 | a* |
| 434 II 25 | 4 | 24 | 738 | 260 | 66.15 | (p) |
| 435 II 14 | 7 | 8 | 727 | 298 | 75.46 | a* |
| 435 VIII 10 | 1 | 37 | 137 | 219 | 34.55 | t |
| 436 II 3 | 6 | 45 | 715 | 296 | 74.76 | a |
| 438 XII 3 | 2 | 10 | 652 | 222 | 45.49 | t* |
| 440 V 17 | 3 | 26 | 57 | 245 | 45.61 | t |
| 442 IX 20 | 6 | 40 | 578 | 298 | 65.64 | a |
| 446 I 13 | 7 | 45 | 295 | 308 | 54.49 | a |
| 446 VII 10 | 1 | 30 | 508 | 217 | 65.32 | a* |
| 447 VI 29 | 3 | 48 | 497 | 250 | 74.55 | a |
| 449 V 8 | 2 | 24 | 448 | 233 | 45.73 | t |
| 454 VIII 10 | 1 | 11 | 138 | 219 | 45.23 | t* |
| 455 VII 30 | 11 | 31 | 127 | 3 | 66.03 | p |
| 457 VI 8 | 1 | 32 | 78 | 219 | 64.73 | a |
| 457 XII 2 | 23 | 55 | 653 | 194 | 54.81 | a |
| 458 V 28 | 10 | 35 | 67 | 333 | 45.53 | t |
| 459 V 18 | 1 | 48 | 57 | 220 | 36.24 | (p) |
| 459 X 12 | 10 | 42 | 600 | 2 | 76.42 | (p) |
| 460 IV 7 | 11 | 11 | 19 | 3 | 44.44 | (t) |
| 461 III 27 | 22 | 36 | 8 | 171 | 55.19 | a |
| 461 IX 20 | 1 | 54 | 578 | 224 | 44.92 | t* |
| 462 III 17 | 2 | 52 | 358 | 232 | 75.96 | a |
| 464 VII 20 | 8 | 18 | 518 | 319 | 65.40 | a* |
| 465 I 13 | 5 | 16 | 293 | 269 | 45.19 | t |
| 465 VII 9 | 10 | 14 | 507 | 346 | 74.68 | (a) |
| 467 V 19 | 9 | 42 | 458 | 343 | 45.80 | t |
| 467 XI 13 | 0 | 47 | 252 | 211 | 74.40 | a |
| 468 V 8 | 1 | 58 | 448 | 225 | 35.04 | t |
| 468 XI 1 | 0 | 6 | 221 | 199 | 75.98 | a |

# TABLE A.

| Date A. D. | Lanka time of conjunction measured from sunrise. | L | μ | γ'. | | Date A. D. | Lanka time of conjunction measured from sunrise. | L | μ | γ'. | | Date A. D. | Lanka time of conjunction measured from sunrise. | L | μ | γ'. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 469 X 21 | 2 h 13 m. | 209 | 229 | 65.77 | a | 519 VIII 11 | 6 h. 6 m | 539 | 284 | 74.86 | a* | 567 VII 21 | 22 h 49 m. | 120 | 173 | 35.81 | t |
| 472 VIII 20 | 5 51 | 148 | 326 | 45.18 | t* | 521 VI 20 | 7 36 | 490 | 311 | 46.02 | p | 568 VI 11 | 7 6 | 82 | 304 | 44.99 | (t) |
| 474 I 4 | 4 10 | 686 | 257 | 46.15 | p | 521 XII 15 | 1 9 | 266 | 213 | 74.88 | (a) | 569 XI 24 | 5 30 | 645 | 279 | 45.01 | t |
| 475 VI 19 | 8 14 | 88 | 319 | 64.67 | a | 522 VI 10 | 0 27 | 480 | 203 | 35.26 | t* | 572 IX 28 | 3 11 | 582 | 246 | 75.75 | a |
| 475 XII 14 | 8 32 | 264 | 322 | 64.81 | a | 522 XII 4 | 0 14 | 254 | 199 | 75.06 | a | 573 III 19 | 7 36 | 1 | 306 | 35.03 | t* |
| 479 IV 8 | 5 54 | 19 | 282 | 55.13 | a | 523 XI 23 | 3 9 | 243 | 242 | 65.74 | a | 573 IX 12 | 3 11 | 571 | 243 | 75.04 | a* |
| 479 X 1 | 10 12 | 589 | 349 | 44.95 | (t) | 526 IX 22 | 8 30 | 181 | 323 | 55.05 | t | 574 III 9 | 6 14 | 350 | 193 | 45.74 | t |
| 480 IX 20 | 2 8 | 379 | 226 | 44.26 | t | 528 II 6 | 6 15 | 719 | 287 | 46.19 | (p) | 574 IX 1 | 5 32 | 560 | 276 | 64.31 | (a) |
| 481 VIII 11 | 7 24 | 539 | 307 | 56.19 | (p) | 529 VII 21 | 4 46 | 119 | 266 | 64.44 | a | 576 VII 11 | 22 59 | 511 | 179 | 35.48 | t |
| 484 I 14 | 5 57 | 296 | 278 | 45.86 | t | 530 I 15 | 10 5 | 698 | 341 | 64.83 | a | 577 I 5 | 0 33 | 285 | 200 | 75.04 | a |
| 485 XI 23 | 8 53 | 243 | 332 | 74.40 | (a) | 531 VI 30 | 7 40 | 99 | 307 | 35.95 | (t) | 577 XII 26 | 4 36 | 276 | 260 | 65.73 | a* |
| 486 V 19 | 0 30 | 459 | 339 | 35.11 | t* | 532 XI 12 | 23 45 | 633 | 195 | 65.72 | (a) | 580 X 24 | 9 12 | 214 | 336 | 54.99 | a |
| 486 XI 12 | 8 4 | 232 | 318 | 75.07 | a | 533 V 10 | 2 59 | 50 | 241 | 64.91 | a | 583 VIII 23 | 2 25 | 151 | 232 | 54.25 | a |
| 487 V 9 | 2 31 | 449 | 232 | 44.37 | (t) | 534 IV 29 | 6 10 | 40 | 286 | 75.69 | a | 584 II 17 | 10 37 | 731 | 349 | 64.88 | a* |
| 487 XI 1 | 10 25 | 220 | 352 | 65.76 | a | 534 X 23 | 3 43 | 612 | 252 | 44.32 | t | 585 VIII 1 | 6 31 | 180 | 289 | 35.75 | t |
| 488 III 29 | 2 49 | 410 | 239 | 66.30 | (p) | 535 IX 18 | 5 21 | 571 | 294 | 56.34 | (p) | 586 XII 16 | 1 30 | 667 | 216 | 55.73 | a |
| 489 III 18 | 4 59 | 759 | 269 | 75.60 | a* | 538 II 15 | 7 43 | 329 | 304 | 45.81 | t | 587 VI 11 | 23 13 | 82 | 184 | 64.66 | (a) |
| 489 IX 11 | 1 39 | 169 | 221 | 44.41 | t | 539 XII 26 | 9 14 | 277 | 333 | 74.38 | a | 588 V 31 | 1 39 | 71 | 216 | 75.44 | a* |
| 490 III 7 | 5 21 | 748 | 271 | 74.87 | a | 540 VI 20 | 7 57 | 490 | 314 | 35.31 | t* | 589 V 20 | 2 47 | 61 | 234 | 66.18 | (p) |
| 491 II 24 | 10 57 | 737 | 352 | 54.15 | (a) | 540 XII 14 | 8 21 | 265 | 319 | 75.05 | a | 589 X 15 | 6 21 | 604 | 297 | 66.44 | (p) |
| 491 VIII 21 | 1 50 | 148 | 219 | 65.91 | (a) | 541 VI 10 | 0 36 | 480 | 203 | 44.58 | t | 590 X 4 | 10 45 | 593 | 0 | 75.78 | a* |
| 493 I 4 | 4 46 | 686 | 265 | 45.50 | t* | 543 IV 20 | 1 27 | 431 | 219 | 75.80 | a | 591 IX 23 | 10 31 | 582 | 354 | 75.08 | a |
| 494 VI 19 | 0 56 | 88 | 208 | 45.37 | t* | 543 X 14 | 2 40 | 202 | 241 | 44.33 | t | 592 III 19 | 8 15 | 1 | 314 | 45.70 | t |
| 496 X 22 | 6 55 | 611 | 303 | 65.70 | t* | 544 IV 8 | 2 45 | 420 | 235 | 65.04 | a | 594 I 27 | 9 1 | 310 | 327 | 74.83 | a |
| 500 II 15 | 8 37 | 328 | 321 | 54.44 | t | 545 III 28 | 10 6 | 409 | 342 | 54.29 | t | 594 VII 23 | 6 35 | 522 | 292 | 35.55 | t |
| 501 VII 30 | 23 21 | 528 | 183 | 74.79 | a | 545 IX 22 | 0 9 | 181 | 196 | 65.78 | a | 595 I 16 | 8 33 | 299 | 319 | 75.03 | a* |
| 502 VII 20 | 1 3 | 518 | 206 | 64.05 | (a) | 547 II 6 | 6 41 | 719 | 291 | 45.55 | t* | 596 XII 25 | 0 39 | 277 | 199 | 46.35 | (p) |
| 503 VI 10 | 0 17 | 479 | 202 | 45.95 | t | 548 VII 20 | 22 55 | 110 | 176 | 45.15 | t | 598 V 10 | 23 17 | 452 | 186 | 65.26 | a |
| 505 V 19 | 0 57 | 459 | 343 | 44.44 | t | 549 XII 5 | 2 55 | 656 | 243 | 76.46 | (p) | 599 IV 30 | 8 19 | 441 | 319 | 44.48 | t |
| 506 XI 1 | 4 44 | 221 | 265 | 56.38 | (p) | 550 XI 24 | 8 17 | 644 | 323 | 65.72 | a* | 601 III 10 | 7 24 | 752 | 304 | 45.64 | t |
| 508 IX 11 | 0 30 | 170 | 202 | 55.09 | t | 551 V 21 | 9 48 | 61 | 348 | 64.88 | a* | 604 I 7 | 3 30 | 689 | 248 | 76.47 | (p) |
| 509 VIII 31 | 0 8 | 159 | 329 | 65.86 | a | 554 III 19 | 8 28 | 0 | 321 | 44.34 | t | 604 XII 26 | 10 7 | 678 | 346 | 55.72 | (a) |
| 512 I 5 | 1 39 | 686 | 216 | 64.82 | a | 555 III 8 | 23 31 | 350 | 184 | 45.07 | t | 605 VI 22 | 5 52 | 92 | 284 | 64.55 | a |
| 512 VI 29 | 0 11 | 98 | 316 | 45.30 | t* | 559 VI 21 | 7 54 | 490 | 312 | 44.66 | t | 606 VI 11 | 7 32 | 82 | 312 | 75.35 | a |
| 513 VI 19 | 0 11 | 88 | 195 | 36.02 | p | 560 XII 3 | 7 0 | 254 | 297 | 56.36 | (p) | 608 IV 20 | 7 19 | 32 | 307 | 44.17 | t |
| 514 V 16 | 9 24 | 50 | 338 | 44.23 | t | 561 IV 30 | 8 1 | 441 | 318 | 75.87 | a | 609 IV 9 | 23 24 | 22 | 185 | 34.92 | (t) |
| 515 X 23 | 3 12 | 611 | 246 | 44.99 | t* | 562 IV 19 | 2 40 | 431 | 340 | 65.11 | a* | 613 VII 23 | 5 52 | 522 | 281 | 44.87 | t* |
| 516 IV 17 | 23 33 | 29 | 185 | 75.77 | a | 562 X 14 | 0 52 | 203 | 210 | 55.00 | a* | 616 V 21 | 6 3 | 462 | 287 | 65.34 | a |
| 517 IV 7 | 0 1 | 19 | 190 | 76.50 | (p) | 563 X 3 | 7 50 | 192 | 312 | 75.75 | a* | 616 XI 15 | 2 8 | 236 | 229 | 64.97 | a* |
| 518 VIII 22 | 5 13 | 550 | 274 | 65.60 | a | 566 II 6 | 2 35 | 720 | 228 | 64.86 | a | 617 XI 4 | 7 35 | 225 | 309 | 75.70 | a* |
| 519 II 15 | 6 58 | 328 | 294 | 45.14 | t* | 566 VIII 1 | 6 27 | 130 | 290 | 45.09 | t* | 618 III 31 | 23 22 | 413 | 187 | 36.37 | (p) |

# TABLE A.

| Date A D | Lanka time of conjunction measured from sunrise. | L | μ | γ'. | | Date A D | Lanka time of conjunction measured from sunrise. | L | μ | γ'. | | Date A D | Lanka time of conjunction measured from sunrise. | L | μ | γ'. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 618 X 24 | 7 h. 21 m. | 213 | 304 | 76.39 | (p) | 663 V 12 | 22 h. 21 m | 54 | 171 | 34.72 | (t) | 714 VIII 14 | 23 h. 4 m | 144 | 180 | 74.86 | a |
| 620 III 10 | 2 10 | 752 | 224 | 64.96 | a | 665 IV 21 | 3 1 | 33 | 237 | 56.28 | (p) | 715 VIII 4 | 1 57 | 134 | 221 | 65.61 | a |
| 620 IX 2 | 5 48 | 162 | 282 | 44.93 | t* | 667 VIII 25 | 4 25 | 554 | 260 | 55.05 | t* | 716 VII 23 | 12 2 | 123 | 10 | 46.32 | (p) |
| 623 XII 27 | 8 9 | 678 | 315 | 45.02 | t | 670 VI 23 | 2 20 | 493 | 231 | 55.58 | a | 719 V 23 | 23 57 | 65 | 192 | 56.07 | p |
| 624 XII 15 | 23 58 | 668 | 192 | 44.35 | t | 670 XII 18 | 3 46 | 270 | 250 | 64.97 | a | 721 IX 26 | 3 55 | 586 | 256 | 55.18 | t* |
| 626 X 26 | 2 18 | 615 | 235 | 75.83 | a | 671 XII 7 | 7 58 | 258 | 318 | 75.68 | a* | 724 VII 24 | 23 13 | 525 | 183 | 55.80 | a |
| 627 IV 21 | 7 8 | 83 | 302 | 34.56 | t* | 672 VI 1 | 5 36 | 473 | 277 | 34.05 | (t) | 725 I 19 | 5 0 | 303 | 266 | 64.94 | a |
| 627 X 15 | 1 42 | 604 | 223 | 75.14 | a* | 672 XI 25 | 7 13 | 247 | 301 | 56.36 | p | 725 VII 14 | 11 19 | 514 | 8 | 45.01 | t |
| 628 IV 9 | 23 54 | 23 | 191 | 45.60 | t | 674 IV 12 | 0 13 | 424 | 198 | 65.12 | a | 726 I 8 | 8 17 | 292 | 313 | 75.66 | a |
| 628 X 3 | 4 39 | 593 | 265 | 64.43 | a | 674 X 5 | 6 28 | 195 | 294 | 44.83 | t | 726 VII 4 | 4 3 | 504 | 253 | 34.27 | t |
| 630 VIII 13 | 22 3 | 543 | 166 | 35.67 | t | 678 I 28 | 10 25 | 712 | 346 | 45.04 | t | 726 XII 28 | 7 28 | 280 | 300 | 76.33 | (p) |
| 631 II 7 | 0 17 | 821 | 194 | 74.99 | a | 678 VII 24 | 9 38 | 123 | 337 | 75.01 | a* | 727 V 25 | 12 9 | 466 | 21 | 46.09 | (p) |
| 632 I 27 | 5 47 | 310 | 275 | 55.69 | a* | 679 VII 13 | 12 4 | 113 | 12 | 65.76 | a | 728 XI 6 | 8 19 | 228 | 323 | 44.79 | t |
| 633 VI 12 | 9 42 | 483 | 344 | 76.21 | (p) | 680 XI 27 | 2 17 | 649 | 238 | 65.87 | a | 729 X 27 | 0 17 | 217 | 201 | 45.46 | t |
| 634 XI 26 | 10 40 | 247 | 356 | 64.97 | (a) | 681 V 23 | 5 52 | 64 | 284 | 34.65 | t | 732 VIII 25 | 6 0 | 155 | 285 | 74.80 | a |
| 637 III 31 | 23 7 | 414 | 182 | 45.74 | t | 681 XI 16 | 1 28 | 637 | 220 | 75.19 | a* | 733 VIII 14 | 9 7 | 144 | 329 | 65.55 | a* |
| 637 IX 24 | 1 32 | 133 | 222 | 54.13 | (a) | 682 V 12 | 22 27 | 54 | 171 | 45.40 | t | 734 XII 30 | 2 29 | 682 | 232 | 55.89 | a |
| 638 III 21 | 0 41 | 403 | 338 | 65.00 | a* | 682 XI 5 | 5 10 | 626 | 274 | 64.49 | (a) | 735 VI 25 | 4 17 | 96 | 260 | 34.43 | t |
| 639 IX 3 | 6 14 | 162 | 287 | 35.59 | t | 686 II 28 | 6 8 | 343 | 281 | 55.61 | t | 735 XII 19 | 1 54 | 671 | 223 | 75.20 | a* |
| 641 I 17 | 3 12 | 700 | 241 | 55.73 | a* | 688 VII 3 | 9 12 | 504 | 334 | 55.66 | a | 737 X 28 | 7 17 | 619 | 311 | 46.54 | (p) |
| 642 XII 27 | 8 50 | 679 | 324 | 44.35 | (t) | 692 IV 22 | 7 15 | 435 | 304 | 65.19 | a* | 740 IV 1 | 5 25 | 15 | 273 | 45.47 | t* |
| 643 VI 21 | 22 36 | 92 | 171 | 65.93 | a | 693 IV 11 | 9 48 | 424 | 339 | 74.43 | a | 742 VIII 5 | 6 25 | 535 | 292 | 55.56 | a |
| 643 XI 17 | 7 15 | 638 | 310 | 66.48 | (p) | 693 X 5 | 7 6 | 195 | 302 | 45.50 | t* | 746 V 25 | 3 39 | 466 | 251 | 65.43 | a |
| 644 XI 5 | 10 14 | 626 | 354 | 75.85 | a* | 695 II 19 | 4 13 | 733 | 255 | 55.78 | t* | 747 V 14 | 5 32 | 456 | 277 | 74.66 | a |
| 645 X 25 | 9 30 | 615 | 341 | 75.16 | a | 697 I 28 | 11 4 | 712 | 354 | 44.37 | t | 747 XI 7 | 9 1 | 228 | 332 | 45.45 | t* |
| 646 IV 21 | 7 32 | 33 | 306 | 45.54 | t | 698 XII 8 | 10 23 | 660 | 353 | 55.87 | (a) | 749 III 23 | 4 11 | 406 | 258 | 45.89 | t |
| 648 II 29 | 7 38 | 343 | 307 | 74.24 | a | 699 XI 27 | 9 34 | 648 | 340 | 75.19 | a | 753 I 9 | 10 28 | 693 | 351 | 55.90 | (a) |
| 648 VIII 24 | 5 57 | 553 | 285 | 35.72 | t | 700 V 23 | 5 47 | 65 | 281 | 45.33 | (t) | 753 XII 29 | 10 3 | 682 | 344 | 75.21 | a |
| 649 II 17 | 7 58 | 332 | 310 | 74.96 | a* | 702 IV 2 | 4 52 | 15 | 269 | 74.07 | a | 754 VI 25 | 3 31 | 96 | 247 | 45.10 | t* |
| 650 VIII 3 | 5 38 | 533 | 275 | 64.21 | (a) | 702 IX 26 | 6 21 | 586 | 294 | 45.84 | t | 756 X 28 | 7 51 | 619 | 318 | 45.91 | t |
| 651 I 27 | 2 48 | 310 | 229 | 46.32 | p | 703 III 22 | 6 16 | 4 | 287 | 64.83 | a | 757 IV 23 | 3 30 | 56 | 249 | 64.63 | a |
| 651 XII 18 | 7 30 | 269 | 308 | 44.20 | t | 704 IX 4 | 3 3 | 565 | 239 | 64.78 | a | 758 X 7 | 1 35 | 597 | 219 | 74.50 | a |
| 653 VI 1 | 6 5 | 473 | 286 | 44.71 | t* | 705 II 28 | 4 4 | 343 | 249 | 46.24 | p | 759 IV 2 | 4 14 | 15 | 254 | 36.11 | (p) |
| 653 XI 25 | 23 48 | 247 | 191 | 75.68 | (a) | 705 VII 25 | 11 40 | 525 | 12 | 76.53 | (p) | 760 II 21 | 11 5 | 336 | 359 | 44.20 | (t) |
| 655 IV 12 | 6 46 | 424 | 208 | 45.50 | t | 706 I 19 | 9 46 | 303 | 339 | 44.27 | t | 761 VIII 5 | 2 25 | 535 | 230 | 45.14 | t* |
| 658 IX 3 | 5 51 | 163 | 279 | 46.29 | p | 707 VII 4 | 3 56 | 504 | 252 | 44.94 | t* | 762 I 30 | 0 4 | 314 | 189 | 75.63 | a |
| 659 VII 25 | 1 57 | 124 | 224 | 64.33 | a | 707 XII 29 | 0 14 | 281 | 194 | 75.67 | a | 763 I 18 | 23 27 | 303 | 178 | 76.31 | (p) |
| 660 I 18 | 1 45 | 701 | 217 | 45.03 | t | 709 V 14 | 4 57 | 456 | 272 | 46.01 | (p) | 764 VI 4 | 10 17 | 477 | 351 | 65.51 | a* |
| 660 VII 13 | 3 5 | 118 | 239 | 75.09 | a* | 710 X 26 | 23 35 | 217 | 192 | 44.80 | t | 764 XI 28 | 2 0 | 250 | 227 | 44.78 | t |
| 661 VII 2 | 5 18 | 102 | 271 | 65.84 | a | 713 X 5 | 6 3 | 195 | 283 | 56.20 | p | 766 XI 7 | 7 13 | 229 | 303 | 56.17 | p |
| 662 V 23 | 3 31 | 64 | 231 | 43.97 | (p) | 714 II 19 | 3 27 | 734 | 242 | 45.09 | t* | 767 IV 3 | 11 56 | 417 | 13 | 45.94 | (t) |

# TABLE A.

| Date A. D. | Lanka time of conjunction measured from sunrise. | | L. | μ. | γ'. | |
|---|---|---|---|---|---|---|
| 768 III 23 | 4 h | 2 m | 406 | 254 | 35.20 | t* |
| 769 IX 4 | 23 | 55 | 160 | 102 | 65.44 | a |
| 770 VIII 25 | 10 | 53 | 155 | 354 | 46.11 | p |
| 772 VII 5 | 10 | 45 | 106 | 355 | 45.08 | t |
| 773 XII 28 | 23 | 14 | 682 | 187 | 64.52 | a |
| 775 V 4 | 10 | 25 | 46 | 353 | 64.56 | (a) |
| 775 X 29 | 4 | 27 | 619 | 265 | 65.25 | a* |
| 779 II 21 | 5 | 11 | 336 | 288 | 64.88 | a |
| 779 VIII 16 | 10 | 8 | 546 | 346 | 45.20 | t |
| 780 II 10 | 7 | 45 | 325 | 305 | 75.81 | a |
| 780 VIII 5 | 2 | 57 | 536 | 236 | 34.47 | t |
| 781 VI 24 | 9 | 28 | 495 | 330 | 54.38 | (p) |
| 782 XII 9 | 10 | 54 | 262 | 359 | 44.78 | (t) |
| 783 XI 29 | 2 | 41 | 251 | 235 | 45.45 | t* |
| 786 IV 8 | 11 | 59 | 417 | 14 | 35.25 | (t) |
| 786 IX 27 | 3 | 40 | 187 | 254 | 74.06 | a |
| 787 III 24 | 4 | 20 | 407 | 266 | 44.52 | t |
| 787 IX 16 | 7 | 34 | 176 | 308 | 65.39 | a* |
| 789 I 31 | 2 | 5 | 716 | 235 | 75.93 | a |
| 789 VII 27 | 2 | 55 | 127 | 239 | 34.22 | t |
| 790 I 20 | 2 | 12 | 704 | 224 | 75.23 | a* |
| 791 I 9 | 8 | 14 | 698 | 313 | 54.59 | (a) |
| 791 VII 6 | 2 | 57 | 106 | 230 | 65.75 | a |
| 792 XI 19 | 1 | 17 | 641 | 218 | 45.93 | t |
| 794 V 4 | 3 | 49 | 47 | 252 | 45.27 | t* |
| 796 IX 6 | 4 | 53 | 567 | 271 | 56.02 | p |
| 800 VI 25 | 23 | 27 | 498 | 188 | 65.09 | a |
| 801 VI 15 | 0 | 42 | 487 | 205 | 74.92 | a |
| 802 VI 4 | 3 | 8 | 476 | 248 | 64.16 | a |
| 802 XI 29 | 0 | 21 | 251 | 198 | 56.17 | (p) |
| 803 IV 25 | 3 | 10 | 435 | 245 | 46.05 | p |
| 806 IX 16 | 2 | 50 | 177 | 285 | 46.05 | (p) |
| 807 II 11 | 9 | 47 | 727 | 340 | 75.96 | (a) |
| 808 I 31 | 10 | 10 | 715 | 343 | 75.25 | a* |
| 808 VII 27 | 1 | 18 | 127 | 213 | 44.59 | t* |
| 809 VII 16 | 9 | 42 | 117 | 337 | 65.65 | a |
| 810 XI 30 | 10 | 5 | 652 | 340 | 45.93 | (t) |
| 812 V 14 | 11 | 10 | 57 | 2 | 45.20 | t* |
| 812 XI 8 | 1 | 11 | 630 | 214 | 74.65 | a |
| 813 V 4 | 3 | 24 | 47 | 244 | 35.95 | t |
| 814 III 25 | 11 | 4 | 8 | 1 | 44.07 | (t) |

| Date A. D. | Lanka time of conjunction measured from sunrise. | | L. | μ. | γ'. | |
|---|---|---|---|---|---|---|
| 815 IX 7 | 1 h | 59 m | 568 | 226 | 45.29 | t |
| 816 III 2 | 22 | 42 | 447 | 170 | 75.59 | (a) |
| 817 II 19 | 22 | 41 | 336 | 167 | 76.23 | (p) |
| 818 VII 7 | 6 | 1 | 508 | 286 | 65.77 | a |
| 818 XII 31 | 4 | 41 | 284 | 243 | 44.77 | (t) |
| 819 VI 26 | 7 | 4 | 497 | 300 | 75.01 | a* |
| 820 XII 9 | 8 | 57 | 262 | 326 | 66.17 | p |
| 821 V 5 | 10 | 39 | 445 | 358 | 46.11 | (p) |
| 822 IV 25 | 8 | 31 | 436 | 249 | 35.37 | t* |
| 823 X 7 | 23 | 22 | 198 | 187 | 65.39 | a |
| 824 IX 26 | 11 | 2 | 187 | 359 | 44.41 | p |
| 826 VIII 7 | 8 | 40 | 158 | 324 | 54.82 | t |
| 829 VI 5 | 6 | 58 | 78 | 301 | 54.33 | a |
| 829 XI 30 | 5 | 41 | 653 | 282 | 65.27 | a |
| 831 V 15 | 10 | 57 | 57 | 357 | 35.86 | t |
| 833 III 25 | 3 | 53 | 8 | 252 | 64.74 | a |
| 833 IX 17 | 10 | 7 | 578 | 348 | 45.33 | t |
| 834 III 14 | 5 | 55 | 365 | 279 | 75.49 | a* |
| 834 IX 7 | 2 | 42 | 568 | 234 | 44.88 | (t)* |
| 835 III 3 | 6 | 12 | 346 | 280 | 76.19 | (p) |
| 836 VII 17 | 12 | 59 | 518 | 25 | 65.85 | (a) |
| 837 XII 31 | 5 | 16 | 284 | 270 | 45.44 | t* |
| 840 V 5 | 11 | 9 | 449 | 4 | 35.45 | t* |
| 840 X 29 | 2 | 57 | 230 | 249 | 74.59 | a |
| 841 IV 25 | 3 | 22 | 439 | 243 | 44.69 | t |
| 841 X 18 | 7 | 31 | 200 | 310 | 65.50 | a |
| 843 III 5 | 0 | 58 | 748 | 204 | 76.08 | p |
| 843 VIII 29 | 2 | 16 | 159 | 251 | 44.05 | (t) |
| 844 II 22 | 1 | 45 | 757 | 217 | 65.30 | a* |
| 845 II 10 | 2 | 20 | 726 | 329 | 54.57 | t |
| 845 VIII 6 | 23 | 23 | 138 | 182 | 66.53 | a |
| 846 XII 22 | 3 | 42 | 675 | 251 | 56.94 | t |
| 848 VI 5 | 1 | 47 | 78 | 221 | 45.05 | t* |
| 850 X 9 | 4 | 50 | 600 | 273 | 56.11 | p |
| 851 IV 5 | 11 | 6 | 19 | 1 | 64.68 | (a) |
| 853 IX 7 | 1 | 31 | 568 | 215 | 58.02 | (p) |
| 854 II 1 | 7 | 23 | 317 | 303 | 54.05 | t |
| 856 VII 5 | 23 | 16 | 506 | 181 | 54.42 | (a) |
| 856 XII 31 | 2 | 5 | 285 | 260 | 66.17 | p |
| 859 V 6 | 10 | 48 | 449 | 357 | 44.76 | t |
| 860 X 8 | 8 | 52 | 209 | 253 | 46.06 | t |

| Date A. D. | Lanka time of conjunction measured from sunrise. | | L. | μ. | γ'. | |
|---|---|---|---|---|---|---|
| 861 III 15 | 7 h | 50 m | 759 | 313 | 76.05 | (p) |
| 862 III 4 | 9 | 21 | 748 | 332 | 65.34 | a* |
| 862 VIII 28 | 23 | 40 | 159 | 190 | 54.71 | t |
| 863 VIII 18 | 6 | 23 | 149 | 288 | 65.47 | a* |
| 864 VIII 6 | 7 | 30 | 138 | 300 | 76.22 | (p) |
| 866 VI 16 | 9 | 5 | 88 | 331 | 44.97 | t* |
| 866 XII 11 | 1 | 25 | 664 | 215 | 74.58 | a |
| 867 VI 6 | 1 | 57 | 78 | 222 | 35.71 | t |
| 869 X 9 | 2 | 49 | 609 | 241 | 45.30 | t* |
| 873 II 1 | 6 | 56 | 317 | 295 | 44.74 | t |
| 873 VII 28 | 2 | 35 | 529 | 238 | 75.26 | a* |
| 874 VII 17 | 6 | 9 | 518 | 284 | 54.50 | a |
| 876 V 27 | 2 | 12 | 470 | 230 | 35.55 | t |
| 877 XI 9 | 0 | 12 | 231 | 200 | 65.28 | a |
| 878 V 6 | 4 | 22 | 449 | 268 | 64.02 | (a) |
| 880 IX 8 | 7 | 20 | 170 | 306 | 54.66 | (t) |
| 883 VII 8 | 2 | 42 | 109 | 251 | 54.10 | (a) |
| 884 I 3 | 7 | 1 | 686 | 298 | 65.28 | a |
| 884 XII 21 | 9 | 31 | 675 | 335 | 74.68 | a |
| 885 VI 16 | 9 | 24 | 89 | 334 | 35.64 | t |
| 888 IV 15 | 2 | 40 | 30 | 234 | 75.30 | a* |
| 888 X 9 | 3 | 33 | 601 | 260 | 44.72 | t |
| 889 IV 4 | 3 | 54 | 19 | 249 | 66.03 | p |
| 890 VIII 19 | 8 | 58 | 550 | 331 | 76.07 | p |
| 891 VIII 8 | 9 | 18 | 539 | 334 | 75.34 | a* |
| 892 II 2 | 7 | 19 | 318 | 290 | 45.41 | t* |
| 894 VI 7 | 9 | 40 | 480 | 341 | 35.63 | t |
| 894 XII 1 | 3 | 14 | 254 | 248 | 74.50 | (a) |
| 895 V 28 | 1 | 28 | 470 | 216 | 44.90 | t |
| 895 XI 20 | 8 | 43 | 243 | 327 | 65.37 | a* |
| 897 IV 5 | 21 | 46 | 420 | 164 | 76.19 | (p) |
| 898 III 26 | 0 | 11 | 410 | 197 | 65.43 | a |
| 899 III 15 | 9 | 28 | 759 | 333 | 54.07 | t |
| 901 I 25 | 5 | 46 | 708 | 279 | 55.97 | t |
| 902 VII 7 | 23 | 40 | 160 | 191 | 44.93 | t |
| 904 XI 10 | 6 | 4 | 633 | 291 | 56.14 | p |
| 905 V 7 | 7 | 52 | 51 | 315 | 64.47 | a |
| 906 IV 26 | 9 | 30 | 40 | 334 | 75.22 | a* |
| 907 X 10 | 1 | 34 | 601 | 218 | 54.01 | (a) |
| 908 III 6 | 8 | 9 | 350 | 316 | 43.93 | (p) |
| 911 II 2 | 3 | 10 | 316 | 234 | 66.15 | p |

# TABLE A.

| Date A. D. | Lanka time of conjunction measured from sunrise. | | L. | μ. | γ'. | |
|---|---|---|---|---|---|---|
| 913 VI 7 | 8 h. | 35 m | 480 | 323 | 44.98 | t* |
| 914 XI 20 | 5 | 58 | 243 | 284 | 45 93 | t |
| 916 IV 5 | 7 | 26 | 420 | 307 | 65 48 | a |
| 916 IX 29 | 23 | 0 | 192 | 183 | 54.58 | (a) |
| 917 IX 19 | 4 | 0 | 181 | 255 | 75.32 | a* |
| 918 IX 8 | 4 | 7 | 170 | 254 | 76.04 | (p) |
| 920 I 23 | 23 | 34 | 709 | 185 | 65 80 | (a) |
| 920 VII 18 | 7 | 17 | 120 | 303 | 44.75 | t |
| 921 I 12 | 1 | 34 | 697 | 213 | 74.60 | (a) |
| 921 VII 8 | 0 | 23 | 110 | 198 | 35.49 | t* |
| 923 XI 11 | 4 | 47 | 633 | 270 | 45 43 | t* |
| 927 III 6 | 8 | 14 | 350 | 316 | 44 66 | t |
| 927 VIII 29 | 23 | 9 | 560 | 183 | 75.46 | a |
| 928 II 24 | 0 | 7 | 340 | 191 | 45.37 | t |
| 928 VIII 18 | 3 | 34 | 550 | 246 | 54 70 | a* |
| 930 VI 29 | 0 | 34 | 501 | 204 | 35 80 | t |
| 931 XII 12 | 1 | 53 | 265 | 222 | 55 26 | a* |
| 935 IV 6 | 0 | 58 | 420 | 208 | 44.77 | t |
| 935 IX 30 | 11 | 29 | 192 | 8 | 75 28 | (a) |
| 936 IX 18 | 11 | 20 | 180 | 3 | 75 99 | a |
| 937 II 13 | 22 | 37 | 781 | 172 | 56 01 | (p) |
| 938 II 3 | 7 | 39 | 720 | 306 | 65 32 | a* |
| 939 I 23 | 9 | 27 | 708 | 331 | 74.61 | a |
| 939 VII 19 | 7 | 57 | 120 | 311 | 35 42 | t* |
| 940 VII 7 | 23 | 54 | 110 | 189 | 46 19 | (p) |
| 942 V 17 | 22 | 21 | 61 | 170 | 78.06 | a |
| 942 XI 11 | 5 | 26 | 634 | 278 | 44.77 | t |
| 943 V 7 | 0 | 40 | 50 | 203 | 66.81 | a* |
| 944 IX 20 | 6 | 21 | 582 | 295 | 76 23 | p |
| 945 IX 9 | 6 | 19 | 571 | 292 | 75.52 | a* |
| 946 III 6 | 8 | 17 | 351 | 315 | 45.34 | t |
| 948 VII 9 | 8 | 2 | 511 | 316 | 35.87 | t |
| 949 VI 25 | 22 | 53 | 501 | 177 | 45.13 | t |
| 949 XII 22 | 10 | 30 | 276 | 350 | 55.26 | a |
| 950 VI 18 | 7 | 21 | 491 | 302 | 64.33 | a |
| 952 IV 26 | 21 | 39 | 441 | 161 | 55.61 | (a) |
| 953 IV 16 | 8 | 34 | 431 | 323 | 44.88 | t* |
| 955 II 25 | 6 | 49 | 741 | 296 | 56.04 | p |
| 958 VII 19 | 7 | 13 | 121 | 298 | 46.13 | p |
| 958 XII 13 | 8 | 6 | 667 | 319 | 56.14 | (p) |
| 959 VI 9 | 3 | 42 | 82 | 252 | 64 21 | a |

| Date A. D. | Lanka time of conjunction measured from sunrise. | | L. | μ. | γ'. | |
|---|---|---|---|---|---|---|
| 960 V 25 | 4 h. | 45 m | 71 | 267 | 74 97 | a* |
| 961 V 17 | 7 | 27 | 61 | 305 | 65.73 | a |
| 965 III 6 | 8 | 0 | 351 | 233 | 66 07 | p |
| 967 VII 10 | 6 | 2 | 512 | 284 | 55.21 | t* |
| 968 XII 22 | 8 | 34 | 277 | 319 | 45 02 | t |
| 970 V 8 | 4 | 38 | 452 | 267 | 55 68 | a |
| 970 XI 1 | 23 | 21 | 225 | 190 | 64.52 | a |
| 971 X 22 | 2 | 49 | 214 | 230 | 75.22 | a* |
| 972 IV 16 | 8 | 23 | 431 | 318 | 34 17 | (t) |
| 972 X 10 | 2 | 19 | 202 | 220 | 75.92 | a |
| 974 II 24 | 23 | 24 | 742 | 183 | 65 38 | (a) |
| 974 VIII 20 | 6 | 18 | 152 | 259 | 44 57 | t |
| 975 II 14 | 0 | 52 | 730 | 202 | 74 66 | a |
| 975 VIII 9 | 23 | 17 | 141 | 182 | 35 30 | t |
| 977 XII 13 | 7 | 25 | 667 | 307 | 45 44 | t* |
| 978 VI 8 | 11 | 9 | 82 | 2 | 74 88 | a |
| 978 XII 2 | 23 | 2 | 656 | 180 | 44 77 | (t) |
| 980 V 17 | 0 | 14 | 61 | 195 | 46.37 | (p) |
| 981 IV 7 | 8 | 20 | 22 | 320 | 34 52 | t |
| 982 III 28 | 0 | 11 | 12 | 195 | 45.25 | t |
| 982 IX 20 | 2 | 22 | 582 | 231 | 54 85 | a* |
| 984 VII 30 | 23 | 9 | 533 | 183 | 36 01 | (t) |
| 986 I 13 | 3 | 41 | 299 | 245 | 55 25 | t |
| 988 V 18 | 11 | 35 | 462 | 11 | 55.76 | a |
| 988 XI 12 | 7 | 39 | 236 | 313 | 64.51 | (a) |
| 989 V 7 | 23 | 32 | 452 | 188 | 44.96 | t |
| 989 XI 1 | 10 | 39 | 225 | 357 | 75.21 | (a) |
| 990 X 21 | 10 | 1 | 213 | 345 | 75 89 | a |
| 991 III 18 | 22 | 47 | 403 | 177 | 56.12 | p |
| 992 III 7 | 7 | 1 | 752 | 298 | 65 42 | a* |
| 993 II 24 | 8 | 21 | 741 | 315 | 74.70 | a |
| 993 VIII 20 | 7 | 5 | 152 | 299 | 35 24 | t* |
| 995 I 4 | 1 | 32 | 680 | 218 | 56 14 | p |
| 996 XII 13 | 7 | 53 | 668 | 312 | 44.78 | t |
| 998 X 23 | 5 | 0 | 615 | 277 | 76.33 | (p) |
| 999 X 12 | 4 | 50 | 604 | 272 | 75 63 | a |
| 1000 IV 7 | 7 | 54 | 23 | 312 | 45.20 | t* |
| 1000 IX 30 | 10 | 18 | 593 | 351 | 54 89 | (a) |
| 1001 IX 19 | 22 | 57 | 582 | 178 | 44 18 | (t) |
| 1002 VIII 11 | 6 | 48 | 543 | 298 | 46 07 | p |
| 1004 VII 20 | 3 | 18 | 522 | 241 | 64.58 | a |

| Date A. D. | Lanka time of conjunction measured from sunrise. | | L. | μ. | γ'. | |
|---|---|---|---|---|---|---|
| 1005 I 13 | 2 h. | 14 m | 299 | 222 | 45 90 | t |
| 1007 V 19 | 6 | 55 | 463 | 299 | 45 03 | t* |
| 1012 VIII 20 | 5 | 32 | 152 | 274 | 55 95 | t |
| 1014 I 4 | 1 | 12 | 690 | 211 | 45 45 | t* |
| 1014 VI 29 | 23 | 58 | 103 | 194 | 74.71 | (a) |
| 1015 VI 19 | 3 | 46 | 92 | 249 | 55.48 | a |
| 1019 IV 8 | 1 | 20 | 23 | 212 | 65.93 | a |
| 1021 VIII 11 | 3 | 44 | 543 | 250 | 55 42 | t |
| 1024 VI 9 | 1 | 27 | 483 | 219 | 55.91 | a |
| 1024 XII 4 | 0 | 24 | 258 | 203 | 64.49 | a |
| 1025 XI 23 | 2 | 36 | 247 | 235 | 75 18 | a* |
| 1026 V 19 | 7 | 15 | 463 | 303 | 34 37 | t |
| 1026 XI 12 | 1 | 50 | 235 | 222 | 75 86 | a |
| 1027 XI 1 | 5 | 37 | 224 | 278 | 66 50 | (p) |
| 1028 IX 21 | 6 | 27 | 184 | 294 | 44 44 | (t) |
| 1029 IX 10 | 23 | 2 | 173 | 181 | 45 15 | (t) |
| 1032 I 15 | 10 | 1 | 701 | 342 | 45.46 | t* |
| 1032 VII 10 | 6 | 26 | 113 | 291 | 74 62 | a |
| 1033 I 4 | 1 | 29 | 690 | 218 | 44 78 | t |
| 1033 VI 29 | 10 | 37 | 102 | 351 | 55.40 | a* |
| 1034 VI 18 | 22 | 0 | 92 | 161 | 46 13 | p |
| 1035 V 10 | 7 | 25 | 54 | 368 | 34 32 | t |
| 1036 IV 28 | 22 | 56 | 44 | 179 | 45 07 | t |
| 1036 X 22 | 2 | 38 | 615 | 237 | 54 93 | a* |
| 1039 VIII 22 | 11 | 7 | 554 | 2 | 55.48 | t |
| 1040 II 15 | 4 | 54 | 332 | 263 | 55.20 | t |
| 1042 VI 20 | 8 | 25 | 494 | 328 | 55 98 | a |
| 1042 XII 15 | 8 | 47 | 269 | 327 | 64 49 | a |
| 1043 VI 9 | 21 | 39 | 483 | 160 | 45.18 | t |
| 1043 XII 4 | 10 | 39 | 258 | 355 | 85 18 | a |
| 1044 XI 22 | 9 | 53 | 247 | 342 | 75 85 | a |
| 1045 IV 19 | 21 | 32 | 455 | 161 | 56 29 | (p) |
| 1046 IV 9 | 4 | 50 | 425 | 268 | 65.58 | a |
| 1047 III 29 | 5 | 54 | 414 | 281 | 74 84 | a |
| 1047 IX 22 | 7 | 11 | 184 | 364 | 45.11 | t |
| 1048 III 17 | 7 | 12 | 403 | 298 | 64 12 | (a) |
| 1049 II 5 | 3 | 17 | 724 | 242 | 46 17 | p |
| 1051 I 15 | 10 | 12 | 701 | 343 | 44 79 | t |
| 1052 XI 24 | 4 | 41 | 648 | 271 | 86 37 | p |
| 1053 XI 13 | 4 | 41 | 637 | 270 | 75 68 | a* |
| 1054 V 10 | 6 | 16 | 55 | 289 | 45 00 | t* |

# TABLE A.

| Date A. D. | Lanka time of conjunction measured from sunrise. | | L. | μ. | γ'. | |
|---|---|---|---|---|---|---|
| 1054 XI 2 | 11 h | 0 m. | 626 | 3 | 54.95 | (a) |
| 1055 X 23 | 0 | 9 | 615 | 198 | 44.26 | (t) |
| 1056 IX 12 | 6 | 24 | 575 | 295 | 46.23 | (p) |
| 1058 VIII 21 | 23 | 48 | 554 | 190 | 74.79 | a |
| 1059 II 15 | 4 | 8 | 332 | 250 | 45.86 | t |
| 1059 VIII 11 | 0 | 16 | 545 | 194 | 74.04 | (a) |
| 1061 VI 20 | 5 | 0 | 494 | 270 | 35.26 | t° |
| 1064 IV 19 | 11 | 47 | 435 | 13 | 65.65 | (a) |
| 1064 X 12 | 23 | 15 | 206 | 188 | 44.39 | t |
| 1066 IX 22 | 4 | 44 | 185 | 265 | 55.82 | a |
| 1068 II 6 | 3 | 25 | 723 | 242 | 45.48 | t° |
| 1069 VII 21 | 0 | 31 | 123 | 200 | 55.24 | a° |
| 1070 VII 10 | 12 | 40 | 113 | 20 | 45.98 | t |
| 1073 V 9 | 22 | 17 | 55 | 167 | 65.78 | a |
| 1074 IV 29 | 0 | 20 | 44 | 196 | 76.50 | (p) |
| 1075 III 19 | 10 | 59 | 4 | 359 | 64.37 | (a) |
| 1075 IX 13 | 2 | 12 | 573 | 230 | 55.59 | a |
| 1076 IX 1 | 6 | 51 | 565 | 297 | 74.85 | a |
| 1079 VII 1 | 12 | 24 | 504 | 20 | 35.38 | t |
| 1079 XII 26 | 2 | 47 | 280 | 234 | 85.16 | a |
| 1080 VI 20 | 5 | 41 | 494 | 275 | 84.59 | t |
| 1080 XII 14 | 2 | 11 | 269 | 224 | 75.85 | a |
| 1081 XII 3 | 6 | 56 | 258 | 295 | 66.47 | (p) |
| 1083 X 13 | 23 | 52 | 206 | 196 | 45.06 | t |
| 1086 VIII 12 | 2 | 27 | 143 | 232 | 74.39 | a |
| 1087 II 6 | 3 | 21 | 723 | 240 | 44.81 | t |
| 1087 VIII 1 | 7 | 39 | 134 | 307 | 55.17 | t° |
| 1089 VI 11 | 5 | 50 | 86 | 284 | 84.11 | t |
| 1090 XI 24 | 4 | 4 | 648 | 257 | 54.96 | a |
| 1091 V 21 | 5 | 1 | 65 | 269 | 65.65 | a |
| 1093 IX 23 | 9 | 55 | 556 | 347 | 65.63 | a° |
| 1094 III 19 | 5 | 8 | 4 | 269 | 45.09 | t° |
| 1097 I 16 | 9 | 40 | 303 | 337 | 74.47 | a |
| 1098 I 5 | 10 | 47 | 292 | 353 | 85.15 | a |
| 1100 V 11 | 1 | 18 | 456 | 217 | 65.80 | a |
| 1101 IV 30 | 2 | 10 | 445 | 228 | 75.05 | a° |
| 1101 X 24 | 8 | 23 | 217 | 324 | 45.04 | t |
| 1102 IV 19 | 4 | 43 | 435 | 263 | 64.30 | (a) |
| 1103 III 10 | 4 | 7 | 755 | 257 | 46.34 | (p) |
| 1106 VIII 1 | 3 | 38 | 134 | 245 | 45.84 | t |
| 1106 XII 27 | 4 | 47 | 652 | 268 | 86.40 | p |

| Date A. D. | Lanka time of conjunction measured from sunrise. | | L. | μ. | γ'. | |
|---|---|---|---|---|---|---|
| 1107 XII 16 | 5 h. | 22 m. | 671 | 276 | 75.69 | a° |
| 1108 VI 11 | 3 | 56 | 86 | 252 | 44.77 | t |
| 1109 V 31 | 11 | 41 | 75 | 5 | 65.57 | a |
| 1109 XI 24 | 2 | 21 | 648 | 230 | 44.30 | (t) |
| 1110 X 15 | 7 | 3 | 608 | 307 | 46.32 | p |
| 1113 III 19 | 4 | 58 | 5 | 265 | 35.75 | t |
| 1115 VII 28 | 8 | 23 | 525 | 245 | 35.47 | t |
| 1118 V 22 | 7 | 54 | 467 | 316 | 65.89 | a |
| 1118 XI 15 | 1 | 18 | 239 | 218 | 44.35 | (t) |
| 1119 V 11 | 8 | 48 | 436 | 324 | 75.13 | a° |
| 1120 X 24 | 4 | 58 | 218 | 270 | 65.75 | a° |
| 1122 III 10 | 4 | 37 | 756 | 262 | 45.57 | t° |
| 1123 VIII 22 | 22 | 17 | 155 | 168 | 55.05 | (t) |
| 1124 VIII 11 | 11 | 16 | 145 | 0 | 45.78 | t° |
| 1126 VI 22 | 10 | 51 | 96 | 357 | 54.69 | (t) |
| 1129 IV 20 | 8 | 55 | 36 | 331 | 54.21 | a |
| 1129 X 18 | 1 | 42 | 608 | 225 | 65.69 | a |
| 1130 X 4 | 4 | 47 | 597 | 269 | 74.98 | a° |
| 1131 IX 23 | 4 | 32 | 586 | 262 | 74.27 | (a) |
| 1133 VIII 2 | 11 | 0 | 536 | 359 | 35.54 | t° |
| 1134 I 27 | 2 | 34 | 314 | 228 | 75.12 | a |
| 1134 VII 23 | 4 | 12 | 526 | 255 | 34.80 | t° |
| 1135 I 16 | 2 | 35 | 302 | 227 | 75.81 | a° |
| 1137 XI 18 | 1 | 41 | 240 | 222 | 45.02 | t° |
| 1140 IX 12 | 23 | 45 | 177 | 194 | 74.22 | a |
| 1141 III 10 | 4 | 3 | 756 | 252 | 44.95 | t |
| 1141 IX 2 | 5 | 30 | 166 | 282 | 54.99 | t° |
| 1143 VIII 12 | 11 | 52 | 145 | 8 | 36.41 | (p) |
| 1144 XII 26 | 6 | 3 | 682 | 283 | 54.97 | t |
| 1145 VI 22 | 0 | 51 | 96 | 205 | 65.40 | a° |
| 1146 VI 11 | 2 | 7 | 86 | 223 | 76.17 | (p) |
| 1147 X 26 | 9 | 46 | 619 | 346 | 65.71 | a° |
| 1148 IV 20 | 4 | 20 | 36 | 260 | 44.93 | t° |
| 1151 II 18 | 9 | 36 | 336 | 336 | 74.40 | a |
| 1152 II 7 | 10 | 18 | 325 | 344 | 75.10 | a° |
| 1153 I 26 | 10 | 37 | 314 | 347 | 75.79 | (a) |
| 1153 VII 23 | 2 | 35 | 520 | 229 | 44.09 | t |
| 1155 VI 1 | 21 | 38 | 477 | 160 | 65.30 | a |
| 1155 XI 26 | 10 | 26 | 251 | 353 | 45.01 | t |
| 1156 V 21 | 1 | 30 | 466 | 216 | 54.53 | a |
| 1160 IX 2 | 2 | 56 | 166 | 237 | 45.67 | t |

| Date A. D. | Lanka time of conjunction measured from sunrise. | | L. | μ. | γ'. | |
|---|---|---|---|---|---|---|
| 1161 I 28 | 4 h | 34 m. | 716 | 263 | 76.43 | (p) |
| 1162 I 17 | 6 | 8 | 704 | 284 | 65.71 | a° |
| 1162 VII 14 | 0 | 58 | 117 | 209 | 54.53 | t |
| 1163 VII 3 | 7 | 25 | 107 | 303 | 65.31 | a° |
| 1164 VI 21 | 8 | 29 | 96 | 318 | 76.[illegible] | (p) |
| 1164 XI 16 | 8 | 39 | 641 | 330 | 56.37 | p |
| 1166 V 1 | 11 | 53 | 47 | 14 | 44.57 | (t) |
| 1167 IV 21 | 4 | 40 | 37 | 263 | 35.60 | t |
| 1168 IX 5 | 11 | 39 | 567 | 13 | 56.41 | p |
| 1169 VIII 24 | 2 | 32 | 557 | 234 | 35.65 | t |
| 1172 I 27 | 1 | 32 | 314 | 209 | 56.42 | p |
| 1173 VI 12 | 4 | 4 | 487 | 256 | [illegible] | a |
| 1174 VI 1 | 8 | 22 | 477 | 319 | 54.61 | a |
| 1174 XI 26 | 6 | 0 | 251 | 284 | 65.73 | a° |
| 1176 IV 11 | 4 | 37 | 428 | 265 | 35.71 | t |
| 1178 III 31 | 4 | 47 | 407 | 262 | 64.21 | (a) |
| 1178 IX 13 | 10 | 59 | 177 | 359 | 45.62 | t° |
| 1180 VII 24 | 8 | 5 | 128 | 315 | 54.46 | (t) |
| 1181 I 16 | 23 | 19 | 704 | 180 | 54.99 | (t) |
| 1183 V 23 | 6 | 9 | 68 | 290 | 54.00 | (p) |
| 1183 XI 17 | 2 | 9 | 641 | 231 | 65.74 | a |
| 1184 XI 5 | 3 | 54 | 630 | 256 | 75.06 | a° |
| 1185 V 1 | 12 | 22 | 47 | 19 | 35.53 | (t) |
| 1185 X 25 | 3 | 25 | 619 | 247 | 74.37 | a |
| 1187 IX 4 | 10 | 30 | 568 | 354 | 35.70 | t° |
| 1188 II 29 | 1 | 20 | 347 | 211 | 75.04 | a |
| 1188 VIII 24 | 3 | 15 | 558 | 244 | 44.99 | t° |
| 1189 II 17 | 2 | 32 | 336 | 224 | 75.74 | a° |
| 1190 VII 4 | 9 | 47 | 508 | 343 | 66.23 | p |
| 1191 VI 23 | 10 | 30 | 498 | 353 | 65.48 | a° |
| 1191 XII 18 | 4 | 0 | 273 | 254 | 55.91 | t |
| 1193 VI 1 | 3 | 8 | 477 | 239 | 43.95 | (p) |
| 1195 IV 12 | 3 | 23 | 428 | 245 | 45.04 | t |
| 1195 X 5 | 5 | 28 | 198 | 280 | 54.88 | t |
| 1197 IX 14 | 11 | 42 | 177 | 8 | 46.27 | (p) |
| 1198 II 7 | 22 | 20 | 726 | 167 | 65.74 | a |
| 1199 I 28 | 7 | 51 | 715 | 308 | 55.00 | t |
| 1201 XI 27 | 10 | 26 | 653 | 355 | 75.75 | (a) |
| 1202 V 23 | 2 | 45 | 65 | 238 | 34.72 | t |
| 1202 XI 16 | 11 | 49 | 641 | 14 | 85.07 | (a) |
| 1205 III 22 | 8 | 7 | 9 | 317 | 74.27 | a |

# TABLE A.

| Date A. D. | Lanka time of conjunction measured from sunrise. | L | μ | γ' | |
|---|---|---|---|---|---|
| 1206 III 11 | 8 h. 38 m. | 358 | 321 | 74.99 | a* |
| 1206 IX 4 | 11 12 | 568 | 3 | 45.94 | t |
| 1207 II 28 | 10 4 | 346 | 346 | 65.71 | (a) |
| 1207 VIII 25 | 0 43 | 558 | 208 | 54.28 | t |
| 1211 XII 7 | 1 40 | 262 | 216 | 76.45 | (p) |
| 1213 IV 22 | 10 52 | 439 | 358 | 45.10 | t* |
| 1214 X 5 | 3 28 | 199 | 248 | 45.56 | t* |
| 1216 II 19 | 6 16 | 737 | 287 | 65.76 | a* |
| 1217 VIII 4 | 3 19 | 138 | 248 | 75.08 | a* |
| 1218 I 28 | 7 23 | 716 | 299 | 44.33 | (t) |
| 1218 VII 24 | 3 53 | 127 | 249 | 75.83 | a* |
| 1220 VI 2 | 10 12 | 78 | 349 | 34.65 | t |
| 1221 V 23 | 3 29 | 68 | 246 | 35.30 | t* |
| 1223 IX 26 | 2 49 | 589 | 241 | 45.78 | t |
| 1226 II 28 | 2 15 | 847 | 221 | 56.34 | p |
| 1227 I 19 | 6 31 | 306 | 290 | 44.33 | t |
| 1227 VII 14 | 23 32 | 518 | 188 | 65.64 | a |
| 1228 VII 3 | 5 4 | 508 | 269 | 54.85 | t* |
| 1228 XII 28 | 7 18 | 284 | 309 | 65.73 | a* |
| 1230 V 14 | 3 34 | 460 | 251 | 35.90 | t |
| 1232 IV 22 | 2 16 | 439 | 227 | 64.38 | (a) |
| 1233 X 5 | 4 13 | 199 | 257 | 46.21 | (p) |
| 1234 VIII 26 | 5 47 | 159 | 283 | 54.26 | (a) |
| 1235 II 19 | 0 38 | 787 | 200 | 45.04 | t |
| 1235 VIII 15 | 10 6 | 149 | 345 | 75.00 | a |
| 1236 VIII 3 | 10 31 | 138 | 349 | 75.75 | a* |
| 1237 XII 19 | 3 3 | 675 | 241 | 75.77 | a* |
| 1238 XII 8 | 3 50 | 664 | 252 | 85.09 | a |
| 1239 VI 3 | 10 58 | 79 | 358 | 35.32 | t* |
| 1239 XI 27 | 3 29 | 652 | 247 | 74.41 | (a) |
| 1240 V 23 | 2 40 | 69 | 232 | 46.10 | p |
| 1241 X 6 | 11 11 | 600 | 7 | 45.81 | (t) |
| 1242 IX 26 | 3 22 | 590 | 248 | 45.12 | t* |
| 1243 III 22 | 1 6 | 8 | 208 | 65.62 | a* |
| 1245 VII 25 | 6 10 | 529 | 287 | 65.72 | a |
| 1246 I 19 | 6 9 | 307 | 283 | 54.99 | t |
| 1247 VII 4 | 1 8 | 508 | 208 | 44.18 | (t) |
| 1248 V 24 | 11 4 | 470 | 3 | 35.97 | t |
| 1249 V 14 | 1 27 | 460 | 218 | 55.24 | t* |
| 1249 XI 6 | 6 27 | 281 | 295 | 54.82 | t |
| 1250 V 3 | 9 8 | 449 | 331 | 64.45 | a |

| Date A. D. | Lanka time of conjunction measured from sunrise. | L | μ | γ' | |
|---|---|---|---|---|---|
| 1253 III 1 | 8 h. 51 m. | 748 | 324 | 45.07 | t* |
| 1255 I 10 | 4 0 | 697 | 255 | 56.41 | (p) |
| 1256 VI 24 | 1 1 | 99 | 210 | 34.50 | t |
| 1258 VI 3 | 9 53 | 79 | 340 | 46.03 | (p) |
| 1260 IV 12 | 5 40 | 30 | 260 | 74.82 | a |
| 1260 X 6 | 11 38 | 601 | 12 | 45.15 | (t) |
| 1261 IV 1 | 8 26 | 19 | 319 | 65.56 | a |
| 1261 IX 25 | 23 44 | 590 | 191 | 54.41 | a |
| 1262 VIII 16 | 12 10 | 550 | 21 | 76.54 | (p) |
| 1265 I 18 | 23 55 | 307 | 187 | 65.71 | a |
| 1266 I 8 | 1 51 | 295 | 215 | 86.44 | (p) |
| 1267 V 25 | 8 36 | 470 | 325 | 55.32 | t* |
| 1268 XI 6 | 5 11 | 232 | 274 | 45.50 | t* |
| 1270 III 23 | 5 24 | 410 | 276 | 55.87 | a |
| 1271 IX 6 | 0 1 | 170 | 196 | 74.88 | a |
| 1272 III 1 | 8 55 | 749 | 323 | 44.40 | t |
| 1272 VIII 25 | 0 11 | 159 | 195 | 75.61 | a |
| 1274 VII 5 | 8 28 | 110 | 321 | 84.48 | t |
| 1275 VI 25 | 1 51 | 100 | 221 | 85.17 | t* |
| 1277 X 28 | 4 17 | 622 | 264 | 45.85 | t |
| 1280 IV 1 | 1 57 | 19 | 220 | 46.21 | p |
| 1281 II 20 | 8 20 | 339 | 317 | 44.27 | t |
| 1282 II 9 | 23 7 | 329 | 177 | 54.96 | (t) |
| 1282 VIII 5 | 2 25 | 539 | 230 | 55.07 | t* |
| 1283 I 30 | 8 5 | 318 | 309 | 65.70 | a |
| 1284 VI 15 | 1 53 | 491 | 225 | 86.12 | (p) |
| 1285 XI 27 | 23 40 | 254 | 191 | 54.81 | t |
| 1287 XI 7 | 5 49 | 232 | 282 | 46.17 | p |
| 1289 III 23 | 0 56 | 416 | 207 | 45.14 | t |
| 1289 IX 16 | 7 11 | 181 | 304 | 74.83 | a |
| 1290 IX 5 | 7 15 | 170 | 302 | 75.55 | a* |
| 1291 VIII 25 | 11 59 | 159 | 11 | 56.26 | p |
| 1292 I 21 | 3 39 | 708 | 248 | 75.50 | a* |
| 1293 I 9 | 3 53 | 697 | 250 | 85.12 | a |
| 1293 VII 6 | 9 18 | 110 | 332 | 35.16 | t |
| 1293 XII 29 | 4 7 | 686 | 252 | 74.44 | a |
| 1294 VI 25 | 0 12 | 100 | 194 | 45.88 | t |
| 1296 X 28 | 4 30 | 623 | 266 | 45.19 | t* |
| 1297 IV 22 | 22 48 | 40 | 176 | 65.48 | a |
| 1299 VIII 27 | 2 50 | 561 | 239 | 65.93 | (a) |
| 1300 II 21 | 7 25 | 340 | 302 | 54.94 | t* |

| Date A. D. | Lanka time of conjunction measured from sunrise. | L | μ | γ' | |
|---|---|---|---|---|---|
| 1300 VIII 15 | 9 h. 47 m. | 550 | 341 | 55.14 | t |
| 1301 VIII 4 | 23 38 | 540 | 186 | 44.39 | t |
| 1302 VI 26 | 9 15 | 501 | 335 | 36.20 | p |
| 1303 VI 15 | 22 40 | 491 | 175 | 55.48 | t |
| 1303 XII 9 | 8 22 | 265 | 321 | 54.81 | t |
| 1304 VI 4 | 5 5 | 481 | 270 | 64.70 | a* |
| 1304 XI 27 | 22 48 | 254 | 177 | 45.49 | (t) |
| 1307 IV 3 | 8 49 | 421 | 326 | 45.19 | t* |
| 1310 VII 26 | 23 31 | 131 | 187 | 34.29 | (t) |
| 1312 VII 5 | 7 19 | 111 | 301 | 45.61 | t |
| 1314 V 15 | 1 38 | 61 | 221 | 74.59 | a |
| 1315 V 4 | 5 51 | 51 | 282 | 55.36 | a* |
| 1315 X 28 | 23 47 | 623 | 193 | 64.48 | a |
| 1317 IX 6 | 10 2 | 571 | 348 | 65.98 | a |
| 1319 II 20 | 23 59 | 340 | 189 | 65.66 | a |
| 1319 VIII 16 | 7 20 | 550 | 302 | 44.46 | (t) |
| 1320 II 10 | 1 22 | 329 | 207 | 76.39 | p |
| 1321 VI 26 | 5 39 | 502 | 280 | 55.56 | t |
| 1322 XII 9 | 7 41 | 265 | 309 | 45.48 | t* |
| 1324 IV 24 | 3 31 | 442 | 251 | 56.03 | p |
| 1325 X 7 | 21 55 | 202 | 167 | 74.75 | (a) |
| 1326 IV 3 | 9 17 | 421 | 332 | 34.52 | t |
| 1328 VIII 6 | 7 11 | 141 | 303 | 34.23 | (t) |
| 1329 VII 27 | 0 18 | 131 | 197 | 34.96 | t* |
| 1331 XI 30 | 6 38 | 656 | 297 | 45.87 | t* |
| 1332 V 25 | 8 9 | 72 | 318 | 64.50 | a |
| 1334 V 4 | 0 42 | 51 | 293 | 46.02 | p |
| 1335 III 25 | 9 0 | 12 | 340 | 44.16 | t |
| 1336 IX 6 | 0 57 | 571 | 210 | [illegible] | t |
| 1337 III 8 | 7 42 | 351 | 305 | 65.62 | a |
| 1339 VII 7 | 12 37 | 512 | 34 | 55.64 | t |
| 1339 XII 31 | 1 49 | 297 | 220 | 54.80 | t |
| 1341 XII 9 | 8 8 | 266 | 314 | 46.15 | p |
| 1342 V 5 | 10 44 | 452 | 359 | 56.09 | (p) |
| 1343 IV 25 | 0 14 | 442 | 199 | 45.30 | t* |
| 1343 X 19 | 5 30 | 218 | 281 | 74.72 | a |
| 1344 X 7 | 5 26 | 202 | 278 | 75.42 | a* |
| 1345 IX 26 | 10 58 | 191 | 358 | 56.11 | p |
| 1346 II 22 | 3 17 | 741 | 243 | 75.87 | a |
| 1347 II 11 | 3 19 | 730 | 241 | 75.17 | a |
| 1347 VIII 7 | 7 54 | 142 | 312 | 44.89 | t |

# TABLE A.

| Date A. D. | Lanka time of conjunction measured from sunrise. | $L$ | $\mu$ | $\gamma'$ | | Date A. D. | Lanka time of conjunction measured from sunrise. | $L$ | $\mu$ | $\gamma'$ | | Date A. D. | Lanka time of conjunction measured from sunrise. | $L$ | $\mu$ | $\gamma'$ | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1348 VII 26 | 21 h 38 m. | 181 | 155 | 35.67 | (t) | 1391 IV 5 | 5 h 59 m | 23 | 280 | 65.48 | a | 1447 IX 10 | 7 h 29 m | 576 | 311 | 66.05 | p |
| 1350 XI 30 | 6 26 | 656 | 293 | 53.22 | t | 1393 VIII 8 | 9 42 | 544 | 341 | 55.87 | a | 1448 III 5 | 4 45 | 354 | 264 | 44.71 | t |
| 1354 III 25 | 7 22 | 12 | 304 | 54.82 | t* | 1394 II 1 | 3 42 | 321 | 246 | 44.78 | (t) | 1448 VIII 29 | 10 1 | 565 | 346 | 75.33 | a |
| 1354 IX 17 | 8 46 | 582 | 328 | 55.29 | t | 1397 V 26 | 22 48 | 473 | 178 | 35.51 | t | 1451 XII 23 | 5 0 | 280 | 269 | 84.64 | (a) |
| 1355 IX 6 | 23 7 | 572 | 181 | 44.56 | (t) | 1398 XI 9 | 5 1 | 235 | 272 | 75.35 | a* | 1452 XII 11 | 5 35 | 269 | 277 | 75.35 | a |
| 1358 I 16 | 10 30 | 299 | 349 | 34.80 | t | 1400 III 26 | 1 29 | 414 | 218 | 76.00 | a | 1453 VI 7 | 5 3 | 485 | 268 | 44.20 | t |
| 1358 VII 7 | 0 36 | 512 | 202 | 64.95 | a* | 1401 III 15 | 1 36 | 403 | 217 | 75.28 | a | 1454 IV 27 | 22 14 | 446 | 172 | 76.20 | p |
| 1358 XII 31 | 1 28 | 288 | 213 | 45.45 | t | 1401 IX 8 | 7 14 | 174 | 305 | 44.73 | t | 1455 IV 16 | 22 35 | 435 | 175 | 75.46 | a |
| 1359 VI 26 | 1 21 | 501 | 211 | 64.19 | (a) | 1402 III 4 | 4 8 | 752 | 252 | 64.55 | (a) | 1456 IV 5 | 2 40 | 424 | 233 | 64.70 | a |
| 1361 V 5 | 7 49 | 452 | 318 | 35.37 | t | 1405 I 1 | 8 30 | 690 | 321 | 55.23 | t* | 1459 II 5 | 10 17 | 723 | 345 | 55.26 | t* |
| 1362 IV 25 | 0 54 | 442 | 208 | 34.63 | (t) | 1406 VI 16 | 6 15 | 93 | 286 | 35.72 | t | 1460 VII 18 | 4 31 | 124 | 259 | 35.50 | t |
| 1364 III 4 | 10 51 | 752 | 357 | 75.90 | (a) | 1407 VI 5 | 23 27 | 83 | 183 | 36.43 | (p) | 1461 VII 7 | 21 50 | 114 | 157 | 36.22 | (p) |
| 1365 II 21 | 10 53 | 741 | 355 | 75.20 | a | 1408 IV 26 | 5 55 | 44 | 285 | 54.65 | t | 1461 XII 2 | [illegible] 14 | 659 | 217 | 66.16 | p |
| 1366 VIII 7 | 4 52 | 142 | 264 | 55.60 | t | 1408 X 19 | 9 9 | 615 | 336 | 55.38 | t | 1462 V 29 | 3 20 | 76 | 246 | 54.42 | t |
| 1367 VII 27 | 11 17 | 131 | 258 | 66.41 | (p) | 1409 X 8 | 23 47 | 604 | 194 | 44.67 | t | 1462 XI 21 | 10 44 | 648 | 359 | 55.41 | (t) |
| 1367 XII 22 | 0 25 | 678 | 202 | 45.86 | (t) | 1412 II 12 | 12 10 | 332 | 13 | 44.76 | (t) | 1463 V 18 | 9 10 | 65 | 332 | 65.19 | a* |
| 1369 VI 5 | 2 46 | 62 | 285 | 55.13 | t* | 1413 II 1 | 3 45 | 321 | 246 | 45.45 | t* | 1463 XI 11 | 1 35 | 637 | 220 | 44.73 | t |
| 1369 XI 30 | 0 37 | 656 | 204 | 64.51 | a | 1415 VI 7 | 6 14 | 484 | 280 | 35.58 | t | 1464 V 6 | 9 57 | 55 | 342 | 75.95 | (a) |
| 1371 X 9 | 8 38 | 604 | 330 | 66.09 | p | 1416 V 26 | 23 37 | 474 | 189 | 34.84 | t | 1467 III 6 | 5 14 | 354 | 269 | 45.37 | t* |
| 1373 III 24 | 22 37 | 12 | 171 | 65.54 | a | 1419 III 26 | 8 45 | 414 | 325 | 75.34 | a* | 1469 VII 9 | 4 35 | 515 | 263 | 35.80 | t |
| 1373 IX 17 | 7 12 | 582 | 303 | 44.60 | (t) | 1420 IX 8 | 8 4 | 174 | 246 | 55.43 | a* | 1470 VI 28 | 21 53 | 505 | 162 | 35.06 | t |
| 1374 III 13 | 23 40 | 1 | 183 | 76.28 | p | 1421 VIII 28 | 7 50 | 163 | 309 | 76.21 | (p) | 1473 IV 27 | 5 24 | 446 | 278 | 75.53 | a |
| 1375 II 1 | 8 42 | 321 | 323 | 64.05 | (a) | 1422 I 23 | 2 54 | 712 | 236 | 45.90 | t | 1474 IV 16 | 9 57 | 435 | 348 | 54.76 | a |
| 1375 VII 29 | 2 37 | 533 | 234 | 55.79 | a | 1423 VII 7 | 23 46 | 113 | 190 | 54.89 | t | 1474 X 11 | 2 15 | 207 | 231 | 65.32 | a* |
| 1376 VII 17 | 7 8 | 522 | 300 | 65.04 | a* | 1424 I 2 | 1 40 | 690 | 215 | 74.52 | (a) | 1475 IX 30 | 5 27 | 195 | 276 | 76.07 | p |
| 1377 I 10 | 10 19 | 299 | 345 | 45.17 | t | 1425 XI 10 | 8 39 | 637 | 339 | 66.15 | p | 1476 II 25 | 4 36 | 745 | 262 | 45.96 | t |
| 1377 VII 6 | 7 48 | 512 | 308 | 64.28 | (a) | 1428 X 9 | 0 25 | 605 | 201 | 44.00 | t | 1478 VII 29 | 12 4 | 135 | 13 | 35.43 | t |
| 1377 XII 31 | 1 44 | 288 | 215 | 46.15 | p | 1429 III 5 | 8 40 | 354 | 324 | 63.98 | (p) | 1479 XII 13 | 9 37 | 670 | 342 | 66.16 | (p) |
| 1378 V 27 | 1 1 | 478 | 213 | 56.23 | (p) | 1430 VIII 19 | 3 9 | 554 | 242 | 75.27 | a* | 1480 VI 8 | 10 18 | 86 | 350 | 54.34 | (t) |
| 1380 V 5 | 8 34 | 453 | 323 | 34.70 | t | 1431 VIII 8 | 3 37 | 543 | 246 | 64.52 | a | 1481 XI 21 | 10 23 | 649 | 352 | 44.73 | t |
| 1381 X 18 | 3 7 | 213 | 242 | 56.05 | p | 1432 II 2 | 3 44 | 322 | 248 | 56.14 | p | 1482 XI 11 | 1 58 | 638 | 225 | 44.05 | (t) |
| 1383 VIII 28 | 23 21 | 163 | 155 | 44.76 | t | 1434 VI 7 | 7 4 | 484 | 300 | 34.91 | t* | 1484 IX 20 | 0 12 | 586 | 201 | 75.44 | a |
| 1384 VIII 17 | 12 10 | 153 | 15 | 55.54 | t | 1435 XI 20 | 4 19 | 246 | 259 | 56.00 | p | 1485 IX 9 | 0 37 | 575 | 204 | 74.71 | a* |
| 1386 I 1 | 9 18 | 690 | 334 | 45.88 | t | 1437 IX 29 | 23 21 | 195 | 188 | 44.65 | t | 1486 III 6 | 4 40 | 355 | 259 | 56.07 | p |
| 1386 VI 27 | 3 37 | 103 | 250 | 64.25 | a | 1438 IX 19 | 10 40 | 185 | 355 | 65.39 | a | 1487 VII 20 | 12 7 | 526 | 16 | 35.87 | (t) |
| 1386 XII 21 | 23 54 | 679 | 192 | 55.23 | a | 1441 I 23 | 1 49 | 712 | 218 | 55.25 | t* | 1488 VII 9 | 5 19 | 516 | 273 | 35.13 | t |
| 1387 VI 16 | 9 13 | 92 | 340 | 55.05 | t* | 1441 VII 18 | 6 53 | 124 | 296 | 54.81 | t* | 1489 XII 22 | 6 15 | 280 | 284 | 55.98 | a |
| 1387 XII 11 | 8 59 | 668 | 328 | 64.51 | (a) | 1442 I 12 | 9 56 | 701 | 338 | 74.52 | a | 1491 V 8 | 12 5 | 456 | 18 | 65.60 | (a) |
| 1388 VI 4 | 22 53 | 82 | 176 | 45.80 | t | 1444 XI 10 | 2 0 | 637 | 230 | 55.41 | t* | 1491 XI 2 | 0 23 | 228 | 205 | 54.58 | t |
| 1389 IV 26 | 8 29 | 44 | 325 | 33.99 | t | 1445 V 7 | 2 31 | 55 | 232 | 65.27 | a* | 1492 X 21 | 10 13 | 218 | 350 | 65.30 | a* |
| 1390 X 9 | 0 52 | 604 | 212 | 55.36 | t | 1446 IV 26 | 3 20 | 44 | 242 | 76.03 | p | 1493 IV 16 | 5 19 | 435 | 272 | 44.09 | t |

# TABLE A.

| Date A. D. | Lanka time of conjunction measured from sunrise. | L. | μ. | γ'. | | Date A. D. | Lanka time of conjunction measured from sunrise. | L. | μ. | γ'. | | Date A. D. | Lanka time of conjunction measured from sunrise. | L. | μ. | γ'. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1493 II 25 | 2 h. 49 m. | 745 | 234 | 55.31 | t* | 1545 VI 9 | 7 h. 48 m. | 487 | 313 | 65.35 | a | 1595 IX 23 | 11 h. 14 m. | 590 | 5 | 46.19 | (p) |
| 1495 VIII 20 | 4 55 | 155 | 269 | 54.62 | t | 1545 XII 4 | 9 12 | 262 | 229 | 54.56 | (t) | 1596 IX 12 | 3 4 | 579 | 243 | 45.61 | t |
| 1496 II 14 | 10 4 | 734 | 340 | 74.57 | a | 1546 XI 23 | 10 40 | 251 | 356 | 75.26 | (a) | 1597 III 7 | 22 27 | 357 | 168 | 65.19 | a |
| 1497 VII 29 | 12 53 | 135 | 23 | 36.09 | (p) | 1547 V 19 | 3 57 | 467 | 252 | 44.29 | t | 1599 II 15 | 0 55 | 330 | 201 | 46.54 | (p) |
| 1498 XII 13 | 4 11 | 671 | 268 | 55.42 | t* | 1549 III 29 | 2 27 | 418 | 231 | 55.43 | t* | 1600 VI 30 | 11 35 | 508 | 6 | 45.88 | t |
| 1499 VI 5 | 22 14 | 66 | 167 | 65.02 | a | 1549 IX 21 | 4 11 | 188 | 261 | 54.48 | t | 1600 XII 25 | 11 30 | 254 | 4 | 75.24 | (a) |
| 1500 V 27 | 22 58 | 75 | 177 | 75.79 | a | 1550 III 18 | 8 53 | 407 | 325 | 74.65 | a | 1601 VI 20 | 2 11 | 495 | 225 | 34.51 | t |
| 1501 X 12 | 0 17 | 608 | 295 | 66.17 | p | 1551 VIII 31 | 12 3 | 167 | 13 | 45.92 | (t) | 1603 V 1 | 0 41 | 450 | 207 | 35.61 | t* |
| 1502 IV 7 | 4 46 | 26 | 267 | 44.58 | t | 1553 I 14 | 6 25 | 704 | 288 | 45.43 | t* | 1604 IV 19 | 6 12 | 439 | 287 | 74.86 | a* |
| 1502 X 1 | 7 30 | 597 | 311 | 75.40 | a* | 1555 VI 18 | 23 22 | 96 | 181 | 56.26 | p | 1605 IV 8 | 6 59 | 428 | 291 | 74.11 | (a) |
| 1503 III 27 | 21 32 | 14 | 156 | 35.20 | (t) | 1555 XI 14 | 6 6 | 641 | 292 | 76.24 | (p) | 1607 II 16 | 8 9 | 737 | 314 | 45.47 | t* |
| 1503 IX 20 | 7 55 | 586 | 315 | 74.76 | (a) | 1556 V 9 | 3 49 | 55 | 254 | 34.39 | t | 1608 II 6 | 0 8 | 727 | 192 | 44.78 | t |
| 1505 I 24 | 4 53 | 314 | 265 | 74.01 | (a) | 1556 XI 2 | 0 10 | 630 | 294 | 75.58 | a* | 1609 XII 16 | 6 31 | 675 | 295 | 76.28 | p |
| 1506 VII 20 | 12 45 | 526 | 24 | 45.21 | t | 1557 X 22 | 6 52 | 619 | 301 | 74.87 | (a) | 1610 VI 11 | 2 15 | 89 | 230 | 34.18 | (t) |
| 1507 I 13 | 6 23 | 302 | 286 | 65.31 | a* | 1558 IV 18 | 11 50 | 38 | 10 | 55.90 | (t) | 1610 XII 5 | 6 2 | 663 | 287 | 85.62 | a* |
| 1507 VII 10 | 2 13 | 516 | 324 | 54.43 | p | 1560 II 26 | 3 57 | 347 | 252 | 74.53 | (a) | 1611 XI 24 | 7 7 | 652 | 303 | 74.92 | a |
| 1509 XI 12 | 6 56 | 240 | 332 | 54.57 | (t) | 1560 VIII 21 | 11 25 | 655 | 7 | 45.40 | t | 1612 V 20 | 9 45 | 69 | 339 | 55.70 | t |
| 1510 V 8 | 0 17 | 456 | 199 | 54.89 | t | 1561 II 14 | 6 41 | 336 | 291 | 65.25 | a* | 1614 IX 23 | 11 1 | 590 | 4 | 45.55 | t |
| 1513 III 7 | 10 51 | 736 | 356 | 55.54 | (t) | 1561 VIII 10 | 23 32 | 547 | 185 | 54.64 | a | 1615 III 19 | 6 8 | 8 | 264 | 65.15 | a* |
| 1514 VIII 20 | 3 25 | 150 | 245 | 35.31 | t* | 1563 XII 15 | 10 52 | 273 | 358 | 54.55 | (t) | 1616 IX 1 | 0 58 | 569 | 207 | 74.46 | a |
| 1516 I 4 | 2 26 | 693 | 231 | 66.16 | p | 1564 VI 8 | 21 27 | 487 | 156 | 55.12 | t | 1617 VII 22 | 10 10 | 529 | 351 | 66.17 | p |
| 1517 VI 19 | 4 40 | 97 | 264 | 64.94 | a* | 1567 IV 9 | 10 1 | 429 | 346 | 55.48 | a | 1619 VII 1 | 9 37 | 509 | 336 | 34.59 | (t) |
| 1517 XII 18 | 4 7 | 471 | 255 | 44.74 | (t) | 1568 IX 21 | 3 28 | 158 | 248 | 45.16 | t* | 1621 V 11 | 7 49 | 460 | 314 | 55.68 | a |
| 1518 VI 8 | 5 24 | 60 | 273 | 65.70 | a* | 1570 II 5 | 3 23 | 726 | 244 | 66.18 | p | 1622 X 24 | 4 35 | 221 | 267 | 45.08 | t |
| 1521 IV 7 | 6 20 | 27 | 276 | 35.24 | t* | 1571 VII 22 | 0 4 | 128 | 105 | 74.88 | a | 1624 III 9 | 3 30 | 759 | 245 | 56.25 | (p) |
| 1523 VIII 11 | 3 23 | 547 | 247 | 35.90 | (t) | 1572 I 15 | 5 43 | 705 | 201 | 44.76 | t* | 1626 II 16 | 3 43 | 738 | 321 | 44.80 | t |
| 1526 I 12 | 23 33 | 302 | 181 | 55.97 | (t) | 1573 VII 10 | 0 49 | 117 | 204 | 65.44 | a | 1627 VIII 1 | 3 30 | 138 | 215 | 55.94 | (a) |
| 1527 V 30 | 1 16 | 477 | 216 | 65.76 | a | 1575 V 10 | 4 38 | 56 | 264 | 35.06 | t* | 1629 VI 11 | 3 0 | 90 | 239 | 34.84 | t* |
| 1528 V 18 | 7 22 | 406 | 305 | 54.97 | t* | 1578 III 8 | 11 22 | 355 | 4 | 74.49 | (a) | 1630 XI 23 | 23 50 | 632 | 192 | 54.24 | t |
| 1528 XI 12 | 3 27 | 240 | 233 | 65.27 | a* | 1579 VIII 22 | 6 40 | 558 | 205 | 54.70 | a | 1631 V 20 | 23 46 | 60 | 157 | 66.45 | (p) |
| 1529 XI 1 | 4 17 | 228 | 250 | 75.99 | a | 1580 II 15 | 1 9 | 330 | 204 | 45.92 | t* | 1631 X 15 | 5 55 | 612 | 260 | 46.23 | (p) |
| 1530 III 29 | 5 7 | 416 | 273 | 46.07 | (p) | 1582 VI 20 | 4 30 | 498 | 262 | 55.20 | t* | 1632 IV 9 | 8 50 | 30 | 320 | 74.33 | t |
| 1532 VIII 30 | 11 20 | 166 | 4 | 35.25 | t | 1582 XII 15 | 3 13 | 278 | 241 | 75.25 | a | 1633 IX 23 | 6 5 | 590 | 273 | 64.96 | a* |
| 1533 VIII 20 | 4 14 | 156 | 255 | 45.97 | (t) | 1583 XII 4 | 4 2 | 262 | 253 | 85.96 | a | 1634 III 19 | 1 37 | 8 | 216 | 45.82 | t |
| 1535 VI 30 | 11 7 | 107 | 0 | 64.85 | a | 1587 IX 22 | 1 1 | 188 | 255 | 45.54 | t | 1636 VII 22 | 1 57 | 520 | 225 | 45.45 | t |
| 1536 VI 18 | 11 51 | 96 | 9 | 65.61 | a* | 1589 II 4 | 23 30 | 726 | 150 | 45.45 | t | 1637 I 16 | 3 54 | 307 | 248 | 75.29 | a |
| 1539 X 11 | 23 4 | 609 | 183 | 74.54 | (a) | 1589 VIII 1 | 6 35 | 135 | 294 | 74.60 | a | 1638 I 5 | 4 6 | 295 | 250 | 65.94 | a |
| 1540 IV 7 | 4 16 | 27 | 256 | 35.95 | t | 1590 VII 21 | 7 24 | 128 | 303 | 65.35 | a* | 1641 X 24 | 4 51 | 221 | 269 | 45.76 | t* |
| 1541 VIII 21 | 11 10 | 557 | 4 | 30.05 | p | 1593 V 20 | 12 9 | 69 | 17 | 34.90 | (t) | 1643 III 10 | 0 46 | 759 | 265 | 45.52 | t* |
| 1542 VIII 11 | 3 49 | 547 | 251 | 45.34 | t | 1593 XI 12 | 22 55 | 641 | 191 | 74.91 | (a) | 1643 IX 3 | 2 56 | 170 | 241 | 74.39 | a |
| 1544 I 24 | 3 8 | 314 | 310 | 55.96 | t | 1594 V 10 | 2 33 | 59 | 231 | 55.77 | t | 1644 VIII 22 | 3 50 | 159 | 251 | 65.13 | a* |

# TABLE A.

| Date A. D. | Lanka time of conjunction measured from sunrise. | L. | μ | γ'. | | Date A. D. | Lanka time of conjunction measured from sunrise. | L. | μ | γ'. | | Date A. D. | Lanka time of conjunction measured from sunrise. | L. | μ | γ'. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1645 VIII 11 | 10 h. 47 m. | 149 | 353 | 55.87 | t | 1693 VI 23 | 11 h. 27 m. | 502 | 8 | 56.00 | p | 1741 XI 27 | 4 h. 43 m. | 656 | 267 | 75.00 | a |
| 1647 VI 22 | 10 23 | 100 | 350 | 34.77 | (t) | 1695 XI 26 | 6 35 | 255 | 293 | 55.73 | t* | 1742 V 22 | 23 50 | 72 | 191 | 35.46 | t* |
| 1647 XII 15 | 23 43 | 674 | 189 | 74.93 | a | 1697 IV 11 | 0 47 | 432 | 208 | 35.65 | t* | 1744 IX 24 | 23 48 | 593 | 196 | 45.75 | (t) |
| 1648 VI 10 | 23 53 | 90 | 190 | 55.35 | t* | 1697 X 5 | 0 29 | 202 | 207 | 74.24 | a | 1745 III 22 | 2 15 | 12 | 227 | 75.77 | a |
| 1650 X 15 | 3 19 | 612 | 249 | 55.61 | t | 1698 IX 24 | 1 36 | 191 | 221 | 64.97 | a* | 1746 III 11 | 3 16 | 1 | 224 | 75.78 | a* |
| 1652 III 29 | 9 34 | 19 | 335 | 45.77 | (t) | 1699 III 21 | 8 3 | 411 | 311 | 54.19 | a | 1747 VIII 26 | 7 52 | 533 | 314 | 66.25 | (t) |
| 1653 III 19 | 1 55 | 9 | 218 | 36.45 | (p) | 1699 IX 13 | 9 27 | 181 | 336 | 55.70 | t* | 1748 VII 14 | 10 25 | 523 | 350 | 75.52 | a* |
| 1654 II 7 | 5 35 | 329 | 276 | 54.50 | a | 1701 VII 24 | 8 22 | 132 | 322 | 44.55 | t | 1749 XII 28 | 8 42 | 288 | 321 | 55.72 | t |
| 1654 VIII 2 | 9 16 | 540 | 333 | 45.49 | t* | 1702 I 17 | 0 43 | 708 | 201 | 64.95 | a | 1751 V 13 | 23 52 | 463 | 195 | 35.84 | t |
| 1656 I 27 | 11 55 | 318 | 9 | 75.22 | (a) | 1703 I 6 | 10 37 | 697 | 349 | 54.26 | (t) | **New Style.** | | | | | |
| 1655 VII 23 | 0 35 | 529 | 201 | 34.74 | t* | 1704 XI 16 | 4 33 | 645 | 267 | 55.67 | t* | 1752 XI 6 | 0 52 | 224 | 211 | 64.88 | a* |
| 1657 VI 1 | 21 46 | 481 | 163 | 55.84 | a | 1706 V 1 | 5 46 | 51 | 325 | 45.60 | t | 1753 V 3 | 6 52 | 453 | 296 | 54.34 | a |
| 1658 V 22 | 2 15 | 471 | 229 | 65.08 | a* | 1707 IV 21 | 1 46 | 41 | 218 | 36.31 | (p) | 1753 X 26 | 9 32 | 213 | 309 | 55.59 | t* |
| 1659 V 11 | 2 31 | 460 | 236 | 74.32 | a | 1708 III 11 | 5 50 | 3 | 231 | 54.41 | a | 1755 IX 6 | 7 8 | 163 | 303 | 44.35 | (t) |
| 1661 III 20 | 8 54 | 416 | 328 | 45.56 | t | 1708 IX 3 | 7 58 | 672 | 316 | 45.67 | t* | 1756 III 1 | 1 12 | 741 | 209 | 65.00 | a |
| 1662 III 10 | 1 28 | 760 | 214 | 44.86 | t | 1709 II 28 | 11 24 | 351 | 2 | 75.14 | (a) | 1758 XII 30 | 6 17 | 679 | 289 | 35.69 | a* |
| 1662 IX 2 | 10 35 | 170 | 359 | 65.07 | a | 1709 VIII 23 | 23 38 | 561 | 189 | 34.93 | t | 1760 VI 13 | 7 17 | 83 | 302 | 35.39 | t |
| 1664 I 18 | 6 51 | 708 | 297 | 76.31 | (p) | 1711 XII 28 | 8 57 | 237 | 328 | 44.36 | t | 1761 VI 3 | 0 38 | 73 | 201 | 36.12 | p |
| 1665 I 6 | 6 8 | 697 | 285 | 95.64 | a* | 1712 VI 22 | 21 35 | 502 | 158 | 75.34 | (a) | 1762 IV 24 | 4 39 | 34 | 266 | 54.26 | (a) |
| 1665 XII 26 | 8 4 | 685 | 313 | 64.94 | a | 1712 XII 17 | 0 31 | 277 | 201 | 45.04 | t | 1762 X 17 | 7 57 | 604 | 319 | 45.78 | t* |
| 1666 VI 22 | 6 52 | 100 | 295 | 55.47 | t | 1715 IV 22 | 6 33 | 442 | 325 | 35.71 | t | 1763 IV 13 | 9 35 | 23 | 335 | 75.00 | a* |
| 1667 VI 11 | 12 55 | 98 | 24 | 66.29 | p | 1716 IV 11 | 1 34 | 432 | 218 | 44.99 | t | 1763 X 6 | 23 42 | 593 | 193 | 45.07 | t |
| 1669 IV 20 | 4 30 | 40 | 262 | 54.96 | t* | 1716 X 4 | 9 11 | 202 | 336 | 64.93 | a | 1764 IV 1 | 9 31 | 12 | 334 | 75.73 | (a) |
| 1671 VIII 24 | 7 12 | 561 | 306 | 66.37 | (p) | 1718 IX 13 | 7 31 | 181 | 310 | 46.33 | (p) | 1766 II 9 | 11 8 | 321 | 359 | 44.34 | (t) |
| 1673 VIII 2 | 8 10 | 540 | 315 | 34.80 | t | 1719 II 5 | 5 50 | 780 | 280 | 75.68 | a* | 1767 I 30 | 3 2 | 310 | 230 | 45.02 | t |
| 1674 VII 23 | 1 21 | 530 | 211 | 34.97 | t | 1720 I 28 | 5 58 | 719 | 325 | 64.96 | a* | 1768 VII 14 | 0 55 | 512 | 204 | 54.08 | (t) |
| 1675 VI 13 | 4 38 | 492 | 266 | 55.92 | (a) | 1720 VII 24 | 3 46 | 132 | 248 | 55.24 | a* | 1769 I 8 | 1 47 | 288 | 215 | 76.47 | (p) |
| 1676 VI 1 | 8 44 | 481 | 226 | 65.17 | a* | 1721 VII 13 | 8 24 | 121 | 316 | 66.04 | p | 1769 VI 4 | 7 24 | 474 | 308 | 35.90 | t |
| 1676 XI 25 | 6 46 | 254 | 298 | 45.05 | t | 1723 V 28 | 2 7 | 72 | 227 | 54.78 | t | 1770 V 25 | 0 33 | 464 | 204 | 45.17 | t* |
| 1677 V 21 | 9 25 | 470 | 334 | 64.41 | a | 1727 IX 4 | 7 32 | 572 | 308 | 34.98 | t | 1770 XI 17 | 8 36 | 235 | 332 | 64.86 | a |
| 1680 III 20 | 9 38 | 411 | 337 | 44.89 | t* | 1728 VIII 24 | 0 12 | 562 | 195 | 44.25 | t | 1772 X 26 | 5 37 | 214 | 324 | 46.23 | p |
| 1681 IX 2 | 1 45 | 170 | 210 | 55.75 | t | 1730 VII 4 | 3 59 | 512 | 254 | 75.43 | a | 1773 III 23 | 4 32 | 403 | 263 | 75.78 | a |
| 1683 VII 14 | 1 7 | 121 | 210 | 44.62 | t | 1730 XII 28 | 9 23 | 258 | 334 | 45.03 | t* | 1774 III 12 | 9 10 | 752 | 320 | 65.03 | a* |
| 1685 XI 16 | 5 48 | 645 | 287 | 46.30 | p | 1731 VI 23 | 4 55 | 502 | 266 | 64.68 | a* | 1774 IX 6 | 1 2 | 163 | 210 | 65.04 | a* |
| 1686 V 12 | 5 16 | 61 | 276 | 64.12 | a | 1731 XII 17 | 23 59 | 277 | 191 | 55.72 | t | 1775 VIII 26 | 4 14 | 153 | 255 | 75.81 | a |
| 1687 V 1 | 11 46 | 51 | 12 | 54.92 | a | 1734 IV 22 | 9 21 | 443 | 335 | 45.05 | t* | 1776 I 21 | 1 55 | 701 | 223 | 46.33 | (p) |
| 1687 X 26 | 4 27 | 623 | 265 | 64.95 | a | 1735 X 5 | 1 22 | 202 | 216 | 55.62 | t | 1777 VII 4 | 23 30 | 103 | 187 | 44.55 | (t) |
| 1688 IV 20 | 1 8 | 41 | 210 | 45.66 | t* | 1737 VIII 14 | 23 31 | 153 | 188 | 44.41 | t | 1781 X 17 | 7 59 | 604 | 318 | 45.16 | t |
| 1690 VIII 24 | 0 16 | 561 | 200 | 45.62 | t | 1738 VIII 4 | 10 47 | 142 | 354 | 55.17 | a | 1782 X 6 | 23 54 | 594 | 194 | 44.39 | t |
| 1691 II 18 | 8 45 | 340 | 246 | 75.17 | a | 1739 XII 19 | 8 15 | 678 | 320 | 46.32 | (p) | 1784 VIII 15 | 23 28 | 544 | 187 | 75.68 | a |
| 1692 II 7 | 3 42 | 329 | 243 | 75.88 | a | 1741 VI 2 | 9 15 | 82 | 334 | 44.70 | t | 1785 II 9 | 11 46 | 321 | 7 | 45.01 | (t) |

# TABLE A.

| Date A. D. | Lanka time of conjunction measured from sunrise. | $L$ | $\mu$ | $\gamma'$ | |
|---|---|---|---|---|---|
| 1785 VIII 5 | 0 h. 43 m. | 533 | 203 | 64.92 | a* |
| 1786 I 30 | 1 58 | 310 | 218 | 55.71 | t* |
| 1788 VI 4 | 8 1 | 474 | 316 | 45.25 | t* |
| 1789 XI 17 | 2 19 | 235 | 231 | 55.55 | t* |
| 1791 IV 8 | 11 50 | 414 | 13 | 75.82 | (a) |
| 1791 IX 27 | 22 39 | 185 | 178 | 44.25 | (t) |
| 1792 IX 16 | 8 18 | 174 | 320 | 64.98 | a |
| 1793 III 12 | 5 11 | 752 | 268 | 44.35 | (t) |
| 1793 IX 5 | 11 2 | 169 | 358 | 75.74 | a* |
| 1794 VIII 25 | 11 31 | 152 | 2 | 66.46 | (p) |
| 1795 I 20 | 23 26 | 791 | 185 | 55.71 | (a) |
| 1795 VII 16 | 6 40 | 114 | 294 | 44.47 | t |
| 1796 I 10 | 5 20 | 690 | 172 | 75.02 | a |
| 1798 VII 4 | 22 9 | 104 | 265 | 35.24 | t |
| 1798 XI 8 | 0 40 | 626 | 216 | 45.83 | (t) |
| 1799 V 4 | 23 17 | 44 | 184 | 74.87 | (a) |
| 1800 IV 23 | 23 36 | 34 | 187 | 75.61 | a |
| 1801 IV 13 | 3 27 | 23 | 242 | 66.32 | (p) |
| 1802 VIII 28 | 6 8 | 554 | 288 | 75.76 | a |
| 1803 VIII 17 | 7 29 | 543 | 305 | 65.00 | a* |
| 1804 II 11 | 10 29 | 322 | 346 | 55.71 | t |
| 1805 VI 26 | 22 22 | 495 | 172 | 36.05 | p |
| 1806 XII 10 | 1 22 | 257 | 217 | 64.84 | a |
| 1807 VI 6 | 4 28 | 475 | 260 | 54.54 | t |
| 1807 XI 29 | 10 53 | 246 | 359 | 55.54 | (t) |
| 1808 XI 18 | 1 44 | 236 | 221 | 46.19 | (p) |
| 1810 IV 4 | 0 45 | 414 | 205 | 55.16 | a |
| 1813 II 1 | 7 55 | 712 | 311 | 65.72 | a* |
| 1814 VII 17 | 5 37 | 114 | 276 | 35.16 | t* |
| 1815 VII 6 | 22 57 | 104 | 175 | 35.91 | t |
| 1816 XI 19 | 9 13 | 687 | 338 | 45.84 | t* |
| 1817 V 16 | 6 0 | 55 | 286 | 74.79 | a* |

| Date A. D. | Lanka time of conjunction measured from sunrise. | $L$ | $\mu$ | $\gamma'$ | |
|---|---|---|---|---|---|
| 1817 XI 9 | 0 h. 57 m. | 626 | 213 | 45.15 | t* |
| 1818 V 5 | 6 27 | 44 | 290 | 75.54 | a |
| 1819 IX 19 | 11 51 | 576 | 17 | 66.53 | (p) |
| 1821 III 4 | 4 55 | 343 | 265 | 44.97 | t |
| 1823 II 11 | 2 24 | 322 | 222 | 76.46 | (p) |
| 1824 VI 26 | 22 47 | 495 | 176 | 45.40 | t |
| 1824 XII 20 | 9 44 | 269 | 341 | 64.88 | a |
| 1825 VI 16 | 11 28 | 485 | 5 | 54.62 | (t) |
| 1827 IV 26 | 2 8 | 435 | 228 | 65.93 | a |
| 1828 IV 14 | 8 22 | 424 | 320 | 55.15 | t* |
| 1828 X 8 | 23 11 | 196 | 185 | 64.89 | a |
| 1829 IX 28 | 1 0 | 185 | 209 | 75.62 | a |
| 1830 II 23 | 3 56 | 734 | 253 | 46.37 | (p) |
| 1832 VII 27 | 13 6 | 124 | 29 | 35.09 | (t) |
| 1833 VII 17 | 6 21 | 114 | 286 | 35.83 | t |
| 1835 XI 20 | 9 35 | 637 | 342 | 45.17 | t |
| 1836 XI 9 | 0 39 | 627 | 206 | 54.47 | t |
| 1840 III 4 | 3 10 | 344 | 237 | 55.67 | t* |
| 1840 VIII 27 | 5 49 | 554 | 279 | 54.38 | (t) |
| 1842 VII 8 | 6 7 | 506 | 286 | 45.47 | t |
| 1843 XII 21 | 4 14 | 269 | 257 | 55.52 | t* |
| 1845 V 6 | 9 1 | 446 | 333 | 66.00 | (p) |
| 1846 X 20 | 6 48 | 207 | 300 | 64.85 | a |
| 1847 IV 15 | 3 26 | 425 | 274 | 44.47 | t |
| 1847 X 9 | 8 12 | 195 | 318 | 75.58 | a* |
| 1848 IX 27 | 8 40 | 184 | 323 | 76.28 | p |
| 1849 II 23 | 0 34 | 734 | 201 | 65.75 | a* |
| 1849 VIII 18 | 4 37 | 145 | 264 | 44.26 | t |
| 1850 II 12 | 5 33 | 723 | 274 | 75.05 | a |
| 1852 XII 11 | 2 36 | 659 | 237 | 45.86 | t |
| 1855 V 16 | 1 17 | 55 | 211 | 56.12 | p |

| Date A. D. | Lanka time of conjunction measured from sunrise. | $L$ | $\mu$ | $\gamma'$ | |
|---|---|---|---|---|---|
| 1856 IV 5 | 4 h. 57 m. | 16 | 270 | 44.21 | (t) |
| 1856 IX 29 | 2 53 | 586 | 242 | 75.94 | (a) |
| 1857 IX 18 | 4 38 | 575 | 266 | 65.19 | a* |
| 1858 III 15 | 11 17 | 355 | 339 | 55.63 | (a) |
| 1861 I 11 | 2 32 | 291 | 230 | 64.82 | (a) |
| 1861 VII 8 | 1 17 | 506 | 212 | 54.78 | a |
| 1862 XII 21 | 4 8 | 269 | 254 | 46.16 | p |
| 1864 V 5 | 23 18 | 446 | 188 | 55.26 | t |
| 1867 III 6 | 3 42 | 745 | 324 | 65.77 | a |
| 1868 VIII 18 | 4 16 | 145 | 267 | 34.95 | t* |
| 1871 VI 18 | 1 34 | 86 | 219 | 74.54 | a |
| 1871 XII 12 | 3 6 | 660 | 243 | 45.19 | t* |
| 1872 VI 6 | 2 28 | 76 | 250 | 65.31 | a* |
| 1874 X 10 | 10 6 | 597 | 352 | 75.89 | a |
| 1875 IV 6 | 5 40 | 16 | 279 | 44.87 | t* |
| 1875 IX 29 | 11 59 | 586 | 17 | 65.24 | (a) |
| 1877 III 15 | 1 58 | 355 | 217 | 76.39 | p |
| 1879 I 22 | 10 56 | 302 | 354 | 64.82 | (a) |
| 1879 VII 19 | 8 10 | 516 | 314 | 54.86 | a |
| 1881 V 27 | 22 40 | 467 | 175 | 66.14 | p |
| 1882 V 17 | 6 38 | 456 | 295 | 55.33 | t* |
| 1887 VIII 19 | 4 43 | 146 | 262 | 45.63 | t |
| 1889 VI 28 | 7 58 | 97 | 314 | 74.46 | a |
| 1890 VI 17 | 9 2 | 86 | 329 | 65.22 | a* |
| 1890 XII 12 | 2 15 | 660 | 228 | 54.50 | t |
| 1894 IV 6 | 3 5 | 16 | 238 | 55.57 | t* |
| 1894 IX 29 | 4 47 | 586 | 267 | 44.54 | t |
| 1895 VIII 20 | 12 0 | 547 | 17 | 36.39 | (p) |
| 1896 VIII 9 | 4 6 | 537 | 256 | 45.79 | t |
| 1898 I 22 | 6 28 | 302 | 287 | 45.51 | t* |
| 1900 XI 22 | 6 21 | 290 | 295 | 74.77 | (a) |

# TABLE B.

| $\lambda + \mu$ | 260° | 270° | 280° | 290° | 300° | 310° | 320° | 330° | 340° | 350° | 0° | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° | 100° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L = 0° $\phi$ = 40° | | 0.08 | 0.07 | 0.08 | 0.10 | 0.13 | 0.18 | 0.25 | 0.33 | 0.43 | 0.53 | 0.61 | 0.69 | 0.74 | 0.78 | 0.81 | 0.82 | 0.82 | | | |
| 30° | | | 0.14 | 0.14 | 0.16 | 0.19 | 0.24 | 0.32 | 0.41 | 0.53 | 0.65 | 0.75 | 0.84 | 0.90 | 0.95 | 0.98 | 0.99 | 0.99 | | | |
| 20° | | | 0.24 | 0.24 | 0.25 | 0.28 | 0.34 | 0.41 | 0.51 | 0.63 | 0.77 | 0.89 | 0.99 | 1.07 | 1.12 | 1.15 | 1.16 | 1.16 | | | |
| 10° | | | | 0.37 | 0.38 | 0.40 | 0.44 | 0.51 | 0.62 | 0.73 | 0.88 | 1.02 | 1.13 | 1.23 | 1.28 | 1.31 | 1.33 | 1.33 | | | |
| 0° | | | | 0.51 | 0.51 | 0.53 | 0.57 | 0.64 | 0.74 | 0.85 | 1.00 | 1.15 | 1.26 | 1.36 | 1.43 | 1.47 | 1.49 | 1.49 | | | |
| L = 10° $\phi$ = 40° | | 0.06 | 0.06 | 0.08 | 0.11 | 0.15 | 0.21 | 0.28 | 0.36 | 0.46 | 0.55 | 0.64 | 0.72 | 0.76 | 0.80 | 0.81 | 0.82 | 0.81 | | | |
| 30° | | | 0.14 | 0.15 | 0.18 | 0.22 | 0.28 | 0.36 | 0.45 | 0.57 | 0.68 | 0.78 | 0.87 | 0.93 | 0.97 | 0.99 | 0.99 | 0.98 | | | |
| 20° | | | 0.25 | 0.26 | 0.27 | 0.31 | 0.37 | 0.45 | 0.55 | 0.67 | 0.81 | 0.93 | 1.03 | 1.10 | 1.14 | 1.16 | 1.16 | 1.15 | | | |
| 10° | | | 0.37 | 0.37 | 0.39 | 0.42 | 0.48 | 0.55 | 0.66 | 0.78 | 0.93 | 1.06 | 1.17 | 1.25 | 1.30 | 1.33 | 1.33 | 1.32 | | | |
| 1° | | | | 0.51 | 0.52 | 0.55 | 0.60 | 0.68 | 0.78 | 0.90 | 1.04 | 1.19 | 1.31 | 1.39 | 1.45 | 1.48 | 1.49 | 1.48 | | | |
| L = 20° $\phi$ = 40° | | 0.07 | 0.08 | 0.10 | 0.14 | 0.18 | 0.25 | 0.32 | 0.41 | 0.50 | 0.59 | 0.67 | 0.74 | 0.78 | 0.81 | 0.81 | 0.81 | 0.79 | 0.76 | | |
| 30° | | 0.13 | 0.16 | 0.17 | 0.21 | 0.25 | 0.32 | 0.40 | 0.50 | 0.61 | 0.72 | 0.82 | 0.90 | 0.95 | 0.98 | 0.99 | 0.98 | 0.96 | | | |
| 20° | | | 0.25 | 0.27 | 0.30 | 0.34 | 0.41 | 0.50 | 0.60 | 0.72 | 0.85 | 0.96 | 1.06 | 1.12 | 1.15 | 1.16 | 1.16 | 1.14 | | | |
| 10° | | | | 0.38 | 0.40 | 0.44 | 0.51 | 0.60 | 0.70 | 0.83 | 0.97 | 1.09 | 1.20 | 1.27 | 1.31 | 1.32 | 1.32 | 1.30 | | | |
| 0° | | | | 0.52 | 0.54 | 0.58 | 0.64 | 0.72 | 0.82 | 0.95 | 1.09 | 1.22 | 1.34 | 1.42 | 1.46 | 1.48 | 1.48 | 1.46 | | | |
| L = 30° $\phi$ = 40° | | 0.05 | 0.09 | 0.12 | 0.16 | 0.21 | 0.27 | 0.35 | 0.44 | 0.54 | 0.63 | 0.69 | 0.75 | 0.79 | 0.80 | 0.80 | 0.79 | 0.77 | 0.73 | | |
| 30° | | 0.15 | 0.16 | 0.19 | 0.23 | 0.29 | 0.36 | 0.44 | 0.54 | 0.65 | 0.75 | 0.85 | 0.92 | 0.96 | 0.98 | 0.98 | 0.97 | 0.94 | 0.89 | | |
| 20° | | | 0.26 | 0.29 | 0.33 | 0.38 | 0.44 | 0.53 | 0.65 | 0.77 | 0.89 | 1.00 | 1.08 | 1.14 | 1.15 | 1.15 | 1.15 | 1.11 | | | |
| 10° | | | 0.39 | 0.41 | 0.44 | 0.49 | 0.56 | 0.65 | 0.77 | 0.88 | 1.02 | 1.14 | 1.24 | 1.29 | 1.32 | 1.32 | 1.30 | 1.28 | | | |
| 0° | | | | 0.54 | 0.57 | 0.63 | 0.69 | 0.77 | 0.88 | 1.01 | 1.15 | 1.28 | 1.38 | 1.44 | 1.48 | 1.48 | 1.46 | 1.43 | | | |
| L = 40° $\phi$ = 40° | 0.08 | 0.09 | 0.11 | 0.15 | 0.19 | 0.24 | 0.32 | 0.40 | 0.48 | 0.57 | 0.65 | 0.71 | 0.76 | 0.79 | 0.79 | 0.78 | 0.75 | 0.72 | 0.69 | | |
| 30° | | 0.17 | 0.19 | 0.23 | 0.27 | 0.32 | 0.40 | 0.48 | 0.59 | 0.69 | 0.80 | 0.88 | 0.94 | 0.96 | 0.97 | 0.95 | 0.92 | 0.89 | 0.84 | | |
| 20° | | | 0.29 | 0.32 | 0.37 | 0.43 | 0.50 | 0.59 | 0.69 | 0.82 | 0.93 | 1.04 | 1.10 | 1.14 | 1.15 | 1.13 | 1.10 | 1.06 | | | |
| 10° | | | 0.40 | 0.44 | 0.48 | 0.53 | 0.62 | 0.70 | 0.81 | 0.94 | 1.06 | 1.18 | 1.27 | 1.30 | 1.31 | 1.29 | 1.27 | 1.22 | | | |
| 0° | | | | 0.58 | 0.61 | 0.67 | 0.74 | 0.82 | 0.93 | 1.07 | 1.19 | 1.32 | 1.41 | 1.45 | 1.48 | 1.47 | 1.43 | 1.39 | | | |
| L = 50° $\phi$ = 40° | 0.09 | 0.11 | 0.14 | 0.17 | 0.22 | 0.29 | 0.35 | 0.43 | 0.51 | 0.60 | 0.68 | 0.73 | 0.77 | 0.78 | 0.78 | 0.76 | 0.72 | 0.69 | 0.64 | 0.59 | |
| 30° | | 0.19 | 0.21 | 0.25 | 0.30 | 0.37 | 0.44 | 0.53 | 0.63 | 0.73 | 0.82 | 0.90 | 0.94 | 0.96 | 0.95 | 0.93 | 0.89 | 0.84 | 0.79 | | |
| 20° | | | 0.32 | 0.36 | 0.40 | 0.47 | 0.54 | 0.64 | 0.74 | 0.85 | 0.97 | 1.06 | 1.12 | 1.14 | 1.13 | 1.10 | 1.06 | 1.01 | | | |
| 10° | | | 0.44 | 0.47 | 0.52 | 0.58 | 0.67 | 0.77 | 0.87 | 0.98 | 1.11 | 1.21 | 1.28 | 1.30 | 1.30 | 1.27 | 1.22 | 1.17 | | | |
| 0° | | | | 0.61 | 0.66 | 0.71 | 0.80 | 0.89 | 1.00 | 1.12 | 1.24 | 1.35 | 1.43 | 1.46 | 1.45 | 1.43 | 1.39 | 1.33 | | | |
| L = 60° $\phi$ = 40° | 0.11 | 0.14 | 0.17 | 0.21 | 0.26 | 0.33 | 0.40 | 0.48 | 0.55 | 0.63 | 0.70 | 0.73 | 0.75 | 0.78 | 0.75 | 0.73 | 0.69 | 0.64 | 0.59 | 0.54 | |
| 30° | | 0.22 | 0.25 | 0.30 | 0.36 | 0.42 | 0.50 | 0.58 | 0.68 | 0.77 | 0.86 | 0.92 | 0.95 | 0.95 | 0.93 | 0.89 | 0.84 | 0.79 | 0.73 | | |
| 20° | | | 0.35 | 0.40 | 0.45 | 0.52 | 0.60 | 0.69 | 0.80 | 0.91 | 1.01 | 1.08 | 1.10 | 1.11 | 1.09 | 1.05 | 1.00 | 0.94 | 0.88 | | |
| 10° | | | 0.49 | 0.52 | 0.57 | 0.65 | 0.73 | 0.82 | 0.94 | 1.06 | 1.16 | 1.24 | 1.29 | 1.30 | 1.27 | 1.24 | 1.18 | 1.11 | | | |
| 0° | | | | 0.66 | 0.72 | 0.79 | 0.87 | 0.96 | 1.07 | 1.18 | 1.30 | 1.39 | 1.44 | 1.45 | 1.44 | 1.39 | 1.34 | 1.27 | | | |
| L = 70° $\phi$ = 40° | 0.15 | 0.17 | 0.21 | 0.25 | 0.32 | 0.38 | 0.44 | 0.52 | 0.59 | 0.65 | 0.72 | 0.75 | 0.77 | 0.76 | 0.73 | 0.69 | 0.65 | 0.59 | 0.54 | 0.49 | |
| 30° | | 0.25 | 0.29 | 0.34 | 0.40 | 0.47 | 0.54 | 0.63 | 0.71 | 0.79 | 0.87 | 0.92 | 0.93 | 0.92 | 0.89 | 0.84 | 0.79 | 0.73 | 0.67 | | |
| 20° | | | 0.40 | 0.45 | 0.51 | 0.57 | 0.66 | 0.75 | 0.85 | 0.94 | 1.03 | 1.09 | 1.11 | 1.10 | 1.05 | 1.00 | 0.94 | 0.89 | 0.82 | | |
| 10° | | | | 0.58 | 0.64 | 0.71 | 0.79 | 0.88 | 0.98 | 1.09 | 1.19 | 1.26 | 1.25 | 1.26 | 1.22 | 1.16 | 1.10 | 1.04 | | | |
| 0° | | | | 0.76 | 0.78 | 0.84 | 0.93 | 1.02 | 1.12 | 1.24 | 1.34 | 1.41 | 1.44 | 1.42 | 1.38 | 1.33 | 1.27 | 1.20 | | | |

# TABLE B.

| $\lambda + \mu$. | 260° | 270° | 280° | 290° | 300° | 310° | 320° | 330° | 340° | 350° | 0° | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° | 100° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L = 80° ϕ = 40° | 0.17 | 0.21 | 0.26 | 0.33 | 0.36 | 0.42 | 0.49 | 0.55 | 0.62 | 0.68 | 0.72 | 0.74 | 0.74 | 0.72 | 0.68 | 0.64 | 0.59 | 0.52 | 0.49 | 0.43 | |
| 30° | | 0.29 | 0.33 | 0.39 | 0.45 | 0.52 | 0.59 | 0.67 | 0.75 | 0.82 | 0.88 | 0.91 | 0.91 | 0.88 | 0.83 | 0.78 | 0.72 | 0.66 | 0.60 | | |
| 20° | | | 0.45 | 0.51 | 0.57 | 0.64 | 0.71 | 0.81 | 0.90 | 0.99 | 1.05 | 1.09 | 1.08 | 1.05 | 1.00 | 0.94 | 0.87 | 0.81 | 0.75 | | |
| 10° | | | | 0.63 | 0.70 | 0.78 | 0.86 | 0.95 | 1.04 | 1.14 | 1.22 | 1.26 | 1.25 | 1.22 | 1.16 | 1.10 | 1.03 | 0.96 | | | |
| 0° | | | | 0.78 | 0.85 | 0.92 | 1.01 | 1.10 | 1.20 | 1.30 | 1.38 | 1.42 | 1.42 | 1.38 | 1.33 | 1.27 | 1.20 | 1.13 | | | |
| L = 90° ϕ = 40° | 0.21 | 0.25 | 0.29 | 0.35 | 0.40 | 0.46 | 0.52 | 0.58 | 0.65 | 0.69 | 0.72 | 0.73 | 0.72 | 0.68 | 0.63 | 0.58 | 0.53 | 0.48 | 0.43 | 0.38 | 0.33 |
| 30° | | 0.34 | 0.39 | 0.45 | 0.51 | 0.57 | 0.65 | 0.72 | 0.80 | 0.85 | 0.89 | 0.90 | 0.88 | 0.84 | 0.78 | 0.72 | 0.66 | 0.60 | 0.55 | 0.49 | |
| 20° | | | 0.51 | 0.56 | 0.62 | 0.70 | 0.77 | 0.86 | 0.94 | 1.01 | 1.06 | 1.07 | 1.05 | 1.00 | 0.94 | 0.86 | 0.80 | 0.73 | 0.67 | | |
| 10° | | | | 0.71 | 0.77 | 0.85 | 0.93 | 1.02 | 1.10 | 1.18 | 1.23 | 1.25 | 1.23 | 1.17 | 1.10 | 1.03 | 0.96 | 0.89 | | | |
| 0° | | | | 0.85 | 0.92 | 0.99 | 1.08 | 1.16 | 1.25 | 1.34 | 1.39 | 1.41 | 1.39 | 1.34 | 1.27 | 1.19 | 1.12 | 1.05 | | | |
| L = 100° ϕ = 40° | 0.25 | 0.29 | 0.34 | 0.38 | 0.44 | 0.50 | 0.55 | 0.61 | 0.66 | 0.69 | 0.71 | 0.70 | 0.68 | 0.64 | 0.58 | 0.53 | 0.47 | 0.42 | 0.37 | 0.32 | 0.28 |
| 30° | | 0.39 | 0.44 | 0.49 | 0.56 | 0.62 | 0.69 | 0.76 | 0.82 | 0.87 | 0.89 | 0.88 | 0.84 | 0.79 | 0.73 | 0.67 | 0.60 | 0.54 | 0.48 | 0.44 | |
| 20° | | | 0.57 | 0.63 | 0.69 | 0.77 | 0.84 | 0.91 | 0.98 | 1.03 | 1.06 | 1.06 | 1.01 | 0.95 | 0.89 | 0.81 | 0.74 | 0.68 | 0.62 | | |
| 10° | | | | 0.77 | 0.85 | 0.90 | 0.99 | 1.07 | 1.14 | 1.20 | 1.23 | 1.22 | 1.17 | 1.11 | 1.04 | 0.96 | 0.89 | 0.82 | | | |
| 0° | | | | 0.92 | 0.98 | 1.05 | 1.14 | 1.22 | 1.30 | 1.36 | 1.39 | 1.38 | 1.33 | 1.26 | 1.19 | 1.11 | 1.04 | 0.97 | | | |
| L = 110° ϕ = 40° | | 0.34 | 0.39 | 0.44 | 0.49 | 0.54 | 0.59 | 0.63 | 0.67 | 0.70 | 0.70 | 0.68 | 0.64 | 0.59 | 0.54 | 0.49 | 0.43 | 0.38 | 0.32 | 0.27 | 0.24 |
| 30° | | 0.45 | 0.50 | 0.56 | 0.61 | 0.67 | 0.73 | 0.78 | 0.83 | 0.86 | 0.87 | 0.84 | 0.79 | 0.73 | 0.67 | 0.61 | 0.54 | 0.48 | 0.43 | 0.39 | |
| 20° | | | 0.64 | 0.70 | 0.76 | 0.82 | 0.89 | 0.95 | 1.00 | 1.04 | 1.04 | 1.01 | 0.95 | 0.89 | 0.81 | 0.74 | 0.67 | 0.62 | 0.56 | | |
| 10° | | | | 0.84 | 0.91 | 0.97 | 1.04 | 1.11 | 1.17 | 1.21 | 1.21 | 1.18 | 1.12 | 1.05 | 0.96 | 0.88 | 0.82 | 0.75 | | | |
| 0° | | | | 1.00 | 1.07 | 1.13 | 1.20 | 1.28 | 1.34 | 1.37 | 1.38 | 1.34 | 1.28 | 1.20 | 1.12 | 1.04 | 0.98 | 0.91 | | | |
| L = 120° ϕ = 40° | | 0.39 | 0.43 | 0.48 | 0.52 | 0.57 | 0.61 | 0.65 | 0.68 | 0.68 | 0.67 | 0.64 | 0.59 | 0.54 | 0.49 | 0.43 | 0.37 | 0.32 | 0.28 | 0.24 | 0.21 |
| 30° | | | 0.55 | 0.60 | 0.66 | 0.71 | 0.76 | 0.80 | 0.84 | 0.85 | 0.84 | 0.79 | 0.74 | 0.67 | 0.61 | 0.54 | 0.48 | 0.43 | 0.38 | 0.34 | |
| 20° | | | 0.70 | 0.75 | 0.81 | 0.86 | 0.92 | 0.97 | 1.01 | 1.02 | 1.00 | 0.95 | 0.89 | 0.82 | 0.75 | 0.67 | 0.61 | 0.55 | 0.51 | | |
| 10° | | | | 0.91 | 0.97 | 1.02 | 1.08 | 1.14 | 1.18 | 1.19 | 1.17 | 1.12 | 1.04 | 0.96 | 0.89 | 0.82 | 0.75 | 0.69 | | | |
| 0° | | | | 1.07 | 1.13 | 1.19 | 1.25 | 1.31 | 1.35 | 1.36 | 1.34 | 1.29 | 1.20 | 1.12 | 1.04 | 0.97 | 0.91 | 0.85 | | | |
| L = 130° ϕ = 40° | | 0.44 | 0.48 | 0.52 | 0.56 | 0.60 | 0.63 | 0.66 | 0.67 | 0.67 | 0.65 | 0.60 | 0.55 | 0.49 | 0.43 | 0.37 | 0.33 | 0.28 | 0.24 | 0.21 | |
| 30° | | | 0.62 | 0.66 | 0.71 | 0.75 | 0.79 | 0.82 | 0.84 | 0.83 | 0.81 | 0.75 | 0.69 | 0.62 | 0.55 | 0.48 | 0.43 | 0.38 | 0.34 | 0.31 | |
| 20° | | | 0.76 | 0.81 | 0.86 | 0.91 | 0.95 | 0.99 | 1.01 | 1.00 | 0.97 | 0.90 | 0.83 | 0.75 | 0.67 | 0.61 | 0.55 | 0.50 | 0.46 | | |
| 10° | | | | 0.97 | 1.02 | 1.07 | 1.11 | 1.16 | 1.18 | 1.17 | 1.14 | 1.06 | 0.97 | 0.89 | 0.81 | 0.74 | 0.68 | 0.63 | | | |
| 0° | | | | 1.14 | 1.19 | 1.24 | 1.28 | 1.32 | 1.35 | 1.34 | 1.29 | 1.22 | 1.13 | 1.05 | 0.97 | 0.88 | 0.84 | 0.79 | | | |
| L = 140° ϕ = 40° | | | 0.52 | 0.55 | 0.58 | 0.61 | 0.64 | 0.65 | 0.65 | 0.64 | 0.60 | 0.56 | 0.50 | 0.43 | 0.38 | 0.33 | 0.28 | 0.24 | 0.21 | 0.18 | |
| 30° | | | 0.65 | 0.69 | 0.73 | 0.77 | 0.80 | 0.82 | 0.82 | 0.80 | 0.76 | 0.70 | 0.62 | 0.55 | 0.49 | 0.43 | 0.38 | 0.34 | 0.30 | | |
| 20° | | | | 0.86 | 0.90 | 0.94 | 0.97 | 0.99 | 1.00 | 0.97 | 0.92 | 0.85 | 0.77 | 0.69 | 0.62 | 0.56 | 0.51 | 0.46 | 0.43 | | |
| 10° | | | | 1.02 | 1.07 | 1.10 | 1.14 | 1.16 | 1.17 | 1.14 | 1.08 | 1.00 | 0.92 | 0.84 | 0.77 | 0.71 | 0.65 | 0.61 | | | |
| 0° | | | | 1.19 | 1.24 | 1.27 | 1.31 | 1.33 | 1.33 | 1.30 | 1.24 | 1.16 | 1.07 | 0.99 | 0.91 | 0.85 | 0.79 | 0.75 | | | |
| L = 150° ϕ = 40° | | | 0.55 | 0.59 | 0.61 | 0.63 | 0.64 | 0.64 | 0.63 | 0.61 | 0.56 | 0.51 | 0.45 | 0.39 | 0.33 | 0.28 | 0.24 | 0.21 | 0.18 | 0.17 | |
| 30° | | | 0.70 | 0.73 | 0.76 | 0.79 | 0.80 | 0.81 | 0.80 | 0.77 | 0.72 | 0.65 | 0.57 | 0.50 | 0.44 | 0.39 | 0.35 | 0.31 | 0.29 | | |
| 20° | | | | 0.89 | 0.92 | 0.96 | 0.97 | 0.98 | 0.97 | 0.93 | 0.87 | 0.79 | 0.70 | 0.62 | 0.55 | 0.50 | 0.46 | 0.43 | 0.40 | | |
| 10° | | | | 1.07 | 1.10 | 1.13 | 1.15 | 1.16 | 1.15 | 1.10 | 1.03 | 0.94 | 0.85 | 0.77 | 0.70 | 0.65 | 0.60 | 0.57 | | | |
| 0° | | | | 1.24 | 1.28 | 1.30 | 1.32 | 1.33 | 1.31 | 1.26 | 1.19 | 1.09 | 1.00 | 0.92 | 0.86 | 0.80 | 0.76 | 0.73 | | | |

# TABLE B.

| λ + μ | 260° | 270° | 280° | 290° | 300° | 310° | 320° | 330° | 340° | 350° | 0° | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° | 100° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L = 160° φ = 40° | | | 0.58 | 0.60 | 0.62 | 0.63 | 0.64 | 0.63 | 0.61 | 0.57 | 0.52 | 0.46 | 0.40 | 0.34 | 0.29 | 0.25 | 0.22 | 0.19 | 0.17 | 0.16 | |
| 30° | | | | 0.76 | 0.78 | 0.79 | 0.80 | 0.79 | 0.77 | 0.72 | 0.66 | 0.59 | 0.52 | 0.45 | 0.39 | 0.34 | 0.31 | 0.28 | 0.27 | | |
| 20° | | | | 0.92 | 0.95 | 0.96 | 0.97 | 0.96 | 0.93 | 0.88 | 0.81 | 0.73 | 0.64 | 0.57 | 0.51 | 0.46 | 0.43 | 0.40 | 0.39 | | |
| 10° | | | | 1.10 | 1.13 | 1.14 | 1.15 | 1.14 | 1.11 | 1.05 | 0.97 | 0.88 | 0.79 | 0.71 | 0.65 | 0.60 | 0.57 | 0.55 | | | |
| 0° | | | | 1.27 | 1.30 | 1.31 | 1.32 | 1.31 | 1.27 | 1.21 | 1.13 | 1.03 | 0.94 | 0.86 | 0.81 | 0.76 | 0.73 | 0.71 | | | |
| L = 170° φ = 40° | | | | 0.62 | 0.63 | 0.63 | 0.62 | 0.60 | 0.57 | 0.52 | 0.47 | 0.39 | 0.33 | 0.29 | 0.24 | 0.21 | 0.18 | 0.16 | 0.15 | | |
| 30° | | | | 0.78 | 0.79 | 0.79 | 0.79 | 0.77 | 0.73 | 0.67 | 0.61 | 0.53 | 0.46 | 0.40 | 0.34 | 0.31 | 0.28 | 0.27 | 0.26 | | |
| 20° | | | | 0.95 | 0.96 | 0.97 | 0.96 | 0.94 | 0.90 | 0.83 | 0.76 | 0.67 | 0.59 | 0.52 | 0.47 | 0.43 | 0.41 | 0.40 | | | |
| 10° | | | | 1.12 | 1.15 | 1.14 | 1.13 | 1.11 | 1.06 | 0.99 | 0.91 | 0.82 | 0.73 | 0.66 | 0.61 | 0.57 | 0.54 | 0.53 | | | |
| 0° | | | | 1.30 | 1.30 | 1.31 | 1.30 | 1.27 | 1.22 | 1.15 | 1.06 | 0.97 | 0.88 | 0.81 | 0.76 | 0.72 | 0.70 | 0.69 | | | |
| L = 180° φ = 40° | | | | 0.63 | 0.63 | 0.62 | 0.60 | 0.57 | 0.54 | 0.49 | 0.42 | 0.36 | 0.30 | 0.25 | 0.21 | 0.18 | 0.17 | 0.16 | 0.16 | | |
| 30° | | | | 0.79 | 0.79 | 0.79 | 0.77 | 0.73 | 0.69 | 0.63 | 0.56 | 0.48 | 0.41 | 0.35 | 0.31 | 0.28 | 0.27 | 0.26 | 0.26 | | |
| 20° | | | | 0.96 | 0.96 | 0.96 | 0.94 | 0.90 | 0.85 | 0.78 | 0.70 | 0.61 | 0.53 | 0.47 | 0.43 | 0.40 | 0.39 | 0.38 | | | |
| 10° | | | | 1.14 | 1.14 | 1.13 | 1.11 | 1.07 | 1.02 | 0.94 | 0.85 | 0.76 | 0.67 | 0.61 | 0.57 | 0.55 | 0.53 | 0.53 | | | |
| 0° | | | | 1.31 | 1.31 | 1.30 | 1.28 | 1.24 | 1.18 | 1.09 | 1.00 | 0.91 | 0.82 | 0.77 | 0.73 | 0.71 | 0.69 | 0.69 | | | |
| L = 190° φ = 40° | | | | 0.63 | 0.62 | 0.60 | 0.57 | 0.54 | 0.49 | 0.44 | 0.38 | 0.31 | 0.26 | 0.21 | 0.18 | 0.16 | 0.15 | 0.15 | 0.16 | | |
| 30° | | | | 0.79 | 0.78 | 0.77 | 0.74 | 0.70 | 0.65 | 0.58 | 0.51 | 0.43 | 0.37 | 0.32 | 0.28 | 0.26 | 0.26 | 0.26 | | | |
| 20° | | | | 0.97 | 0.96 | 0.94 | 0.91 | 0.87 | 0.81 | 0.73 | 0.65 | 0.56 | 0.49 | 0.44 | 0.41 | 0.39 | 0.39 | 0.40 | | | |
| 10° | | | | 1.14 | 1.13 | 1.11 | 1.08 | 1.03 | 0.97 | 0.88 | 0.79 | 0.70 | 0.62 | 0.57 | 0.54 | 0.53 | 0.53 | 0.54 | | | |
| 0° | | | | 1.31 | 1.30 | 1.28 | 1.24 | 1.19 | 1.12 | 1.03 | 0.94 | 0.85 | 0.78 | 0.73 | 0.70 | 0.69 | 0.69 | 0.70 | | | |
| L = 200° φ = 40° | | | | | 0.60 | 0.58 | 0.54 | 0.50 | 0.45 | 0.39 | 0.33 | 0.27 | 0.22 | 0.18 | 0.16 | 0.15 | 0.16 | 0.17 | | | |
| 30° | | | | | 0.77 | 0.74 | 0.70 | 0.66 | 0.60 | 0.52 | 0.45 | 0.38 | 0.32 | 0.25 | 0.26 | 0.26 | 0.26 | 0.28 | | | |
| 20° | | | | 0.96 | 0.94 | 0.91 | 0.87 | 0.82 | 0.75 | 0.66 | 0.58 | 0.50 | 0.44 | 0.40 | 0.38 | 0.38 | 0.39 | 0.41 | | | |
| 10° | | | | 1.14 | 1.11 | 1.08 | 1.04 | 0.98 | 0.91 | 0.82 | 0.73 | 0.65 | 0.58 | 0.54 | 0.53 | 0.53 | 0.55 | 0.57 | | | |
| 0° | | | | 1.30 | 1.28 | 1.25 | 1.20 | 1.14 | 1.07 | 0.98 | 0.88 | 0.80 | 0.73 | 0.70 | 0.69 | 0.69 | 0.71 | 0.73 | | | |
| L = 210° φ = 40° | | | | | 0.58 | 0.55 | 0.50 | 0.46 | 0.40 | 0.34 | 0.28 | 0.22 | 0.18 | 0.15 | 0.15 | 0.15 | 0.17 | 0.19 | | | |
| 30° | | | | | 0.74 | 0.71 | 0.66 | 0.61 | 0.54 | 0.47 | 0.40 | 0.33 | 0.29 | 0.26 | 0.25 | 0.26 | 0.28 | 0.31 | | | |
| 20° | | | | | 0.91 | 0.87 | 0.82 | 0.76 | 0.69 | 0.61 | 0.52 | 0.45 | 0.40 | 0.38 | 0.37 | 0.39 | 0.41 | 0.44 | | | |
| 10° | | | | 1.11 | 1.08 | 1.04 | 0.99 | 0.93 | 0.85 | 0.76 | 0.67 | 0.60 | 0.55 | 0.53 | 0.52 | 0.54 | 0.57 | 0.60 | | | |
| 0° | | | | 1.28 | 1.25 | 1.20 | 1.15 | 1.08 | 1.00 | 0.91 | 0.82 | 0.75 | 0.70 | 0.68 | 0.69 | 0.71 | 0.73 | 0.77 | | | |
| L = 220° φ = 40° | | | | | 0.55 | 0.51 | 0.46 | 0.41 | 0.34 | 0.28 | 0.23 | 0.18 | 0.15 | 0.14 | 0.15 | 0.16 | 0.19 | 0.22 | | | |
| 30° | | | | | 0.71 | 0.66 | 0.61 | 0.55 | 0.48 | 0.40 | 0.34 | 0.28 | 0.25 | 0.24 | 0.25 | 0.27 | 0.30 | 0.34 | | | |
| 20° | | | | | 0.88 | 0.83 | 0.77 | 0.70 | 0.63 | 0.55 | 0.47 | 0.41 | 0.38 | 0.37 | 0.38 | 0.41 | 0.45 | 0.49 | | | |
| 10° | | | | | 1.05 | 1.00 | 0.94 | 0.86 | 0.78 | 0.70 | 0.61 | 0.54 | 0.51 | 0.51 | 0.53 | 0.56 | 0.60 | 0.64 | | | |
| 0° | | | | 1.25 | 1.21 | 1.16 | 1.10 | 1.02 | 0.93 | 0.85 | 0.76 | 0.70 | 0.67 | 0.67 | 0.69 | 0.73 | 0.77 | 0.81 | | | |
| L = 230° φ = 40° | | | | | 0.51 | 0.47 | 0.42 | 0.35 | 0.29 | 0.24 | 0.19 | 0.16 | 0.14 | 0.14 | 0.16 | 0.19 | 0.22 | | | | |
| 30° | | | | | 0.67 | 0.62 | 0.56 | 0.49 | 0.42 | 0.35 | 0.30 | 0.25 | 0.24 | 0.24 | 0.27 | 0.30 | 0.35 | | | | |
| 20° | | | | | 0.83 | 0.78 | 0.71 | 0.64 | 0.56 | 0.48 | 0.41 | 0.37 | 0.35 | 0.37 | 0.40 | 0.44 | 0.49 | | | | |
| 10° | | | | | 0.99 | 0.94 | 0.87 | 0.79 | 0.71 | 0.62 | 0.55 | 0.50 | 0.49 | 0.51 | 0.54 | 0.59 | 0.64 | 0.69 | | | |
| 0° | | | | 1.21 | 1.16 | 1.10 | 1.02 | 0.93 | 0.86 | 0.78 | 0.70 | 0.66 | 0.65 | 0.67 | 0.71 | 0.75 | 0.81 | 0.88 | | | |

## TABLE B.

| λ + μ. | 260° | 270° | 280° | 290° | 300° | 310° | 320° | 330° | 340° | 350° | 0° | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° | 100° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L = 240° φ = 40° | | | | | 0.46 | 0.41 | 0.35 | 0.29 | 0.24 | 0.19 | 0.15 | 0.13 | 0.13 | 0.15 | 0.18 | 0.22 | 0.26 | | | | |
| 30° | | | | | 0.61 | 0.55 | 0.49 | 0.43 | 0.36 | 0.30 | 0.25 | 0.22 | 0.23 | 0.25 | 0.29 | 0.34 | 0.39 | | | | |
| 20° | | | | | 0.78 | 0.72 | 0.65 | 0.57 | 0.49 | 0.43 | 0.37 | 0.34 | 0.35 | 0.38 | 0.43 | 0.49 | 0.54 | | | | |
| 10° | | | | | 0.94 | 0.87 | 0.81 | 0.73 | 0.64 | 0.57 | 0.51 | 0.48 | 0.49 | 0.53 | 0.58 | 0.64 | 0.70 | 0.76 | | | |
| 0° | | | | 1.16 | 1.10 | 1.04 | 0.96 | 0.88 | 0.79 | 0.72 | 0.66 | 0.64 | 0.65 | 0.69 | 0.74 | 0.80 | 0.86 | 0.93 | | | |
| L = 250° φ = 40° | | | | | | 0.35 | 0.29 | 0.24 | 0.18 | 0.14 | 0.13 | 0.12 | 0.14 | 0.18 | 0.22 | 0.27 | 0.32 | | | | |
| 30° | | | | | 0.55 | 0.49 | 0.42 | 0.36 | 0.29 | 0.24 | 0.22 | 0.22 | 0.24 | 0.28 | 0.34 | 0.40 | 0.45 | | | | |
| 20° | | | | | 0.71 | 0.65 | 0.57 | 0.50 | 0.43 | 0.37 | 0.34 | 0.34 | 0.37 | 0.42 | 0.48 | 0.55 | 0.61 | | | | |
| 10° | | | | | 0.87 | 0.81 | 0.73 | 0.65 | 0.57 | 0.50 | 0.47 | 0.48 | 0.51 | 0.57 | 0.64 | 0.71 | 0.77 | | | | |
| 0° | | | | 1.09 | 1.03 | 0.97 | 0.89 | 0.81 | 0.73 | 0.66 | 0.63 | 0.63 | 0.67 | 0.73 | 0.80 | 0.87 | 0.94 | 1.00 | | | |
| L = 260° φ = 40° | | | | | 0.34 | 0.29 | 0.23 | 0.18 | 0.13 | 0.11 | 0.10 | 0.12 | 0.17 | 0.22 | 0.27 | 0.32 | | | | | |
| 30° | | | | | 0.48 | 0.42 | 0.35 | 0.29 | 0.24 | 0.21 | 0.20 | 0.23 | 0.28 | 0.33 | 0.40 | 0.47 | 0.53 | | | | |
| 20° | | | | | 0.64 | 0.57 | 0.50 | 0.43 | 0.37 | 0.33 | 0.32 | 0.35 | 0.40 | 0.47 | 0.54 | 0.62 | 0.69 | | | | |
| 10° | | | | | 0.80 | 0.72 | 0.65 | 0.58 | 0.52 | 0.47 | 0.45 | 0.49 | 0.55 | 0.62 | 0.70 | 0.78 | 0.85 | | | | |
| 0° | | | | 1.02 | 0.96 | 0.88 | 0.81 | 0.73 | 0.67 | 0.62 | 0.60 | 0.63 | 0.70 | 0.78 | 0.86 | 0.93 | 1.01 | 1.08 | | | |
| L = 270° φ = 40° | | | | | 0.28 | 0.23 | 0.18 | 0.14 | 0.11 | 0.10 | 0.11 | 0.15 | 0.21 | 0.27 | 0.33 | 0.40 | | | | | |
| 30° | | | | | 0.41 | 0.36 | 0.29 | 0.24 | 0.21 | 0.19 | 0.21 | 0.26 | 0.32 | 0.39 | 0.47 | 0.54 | 0.61 | | | | |
| 20° | | | | | 0.56 | 0.49 | 0.42 | 0.37 | 0.32 | 0.30 | 0.32 | 0.37 | 0.45 | 0.53 | 0.61 | 0.69 | 0.76 | | | | |
| 10° | | | | 0.80 | 0.72 | 0.65 | 0.58 | 0.52 | 0.47 | 0.44 | 0.46 | 0.51 | 0.59 | 0.68 | 0.76 | 0.85 | 0.93 | | | | |
| 0° | | | | 0.95 | 0.88 | 0.81 | 0.74 | 0.67 | 0.62 | 0.59 | 0.61 | 0.66 | 0.74 | 0.83 | 0.92 | 1.01 | 1.08 | 1.15 | | | |
| L = 280° φ = 40° | | | | | 0.23 | 0.18 | 0.13 | 0.11 | 0.10 | 0.10 | 0.14 | 0.19 | 0.26 | 0.33 | 0.40 | 0.46 | | | | | |
| 30° | | | | | 0.35 | 0.29 | 0.24 | 0.20 | 0.18 | 0.19 | 0.23 | 0.29 | 0.35 | 0.46 | 0.53 | 0.60 | 0.67 | | | | |
| 20° | | | | | 0.49 | 0.43 | 0.37 | 0.31 | 0.29 | 0.30 | 0.33 | 0.42 | 0.51 | 0.60 | 0.69 | 0.76 | 0.83 | | | | |
| 10° | | | | 0.71 | 0.65 | 0.57 | 0.51 | 0.46 | 0.42 | 0.43 | 0.48 | 0.55 | 0.65 | 0.75 | 0.84 | 0.92 | 1.00 | | | | |
| 0° | | | | 0.87 | 0.81 | 0.74 | 0.67 | 0.62 | 0.58 | 0.58 | 0.63 | 0.71 | 0.81 | 0.91 | 1.00 | 1.09 | 1.16 | 1.22 | | | |
| L = 290° φ = 40° | | | | | 0.17 | 0.13 | 0.11 | 0.09 | 0.10 | 0.13 | 0.18 | 0.26 | 0.33 | 0.40 | 0.47 | 0.55 | | | | | |
| 30° | | | | | 0.28 | 0.23 | 0.19 | 0.17 | 0.18 | 0.21 | 0.27 | 0.35 | 0.44 | 0.53 | 0.61 | 0.68 | 0.74 | | | | |
| 20° | | | | | 0.42 | 0.37 | 0.32 | 0.29 | 0.28 | 0.32 | 0.39 | 0.48 | 0.58 | 0.68 | 0.77 | 0.84 | 0.91 | | | | |
| 10° | | | | 0.63 | 0.57 | 0.51 | 0.46 | 0.42 | 0.41 | 0.45 | 0.51 | 0.62 | 0.72 | 0.88 | 0.92 | 1.00 | 1.07 | | | | |
| 0° | | | | 0.79 | 0.72 | 0.66 | 0.61 | 0.57 | 0.56 | 0.58 | 0.65 | 0.76 | 0.86 | 0.97 | 1.07 | 1.15 | 1.23 | 1.29 | | | |
| L = 300° φ = 40° | | | | | 0.13 | 0.10 | 0.08 | 0.09 | 0.11 | 0.16 | 0.23 | 0.30 | 0.39 | 0.46 | 0.53 | 0.59 | | | | | |
| 30° | | | | 0.29 | 0.24 | 0.20 | 0.18 | 0.17 | 0.19 | 0.26 | 0.33 | 0.42 | 0.52 | 0.60 | 0.68 | 0.75 | 0.81 | | | | |
| 20° | | | | 0.41 | 0.36 | 0.31 | 0.28 | 0.27 | 0.29 | 0.34 | 0.43 | 0.54 | 0.65 | 0.75 | 0.83 | 0.91 | 0.97 | | | | |
| 10° | | | | 0.57 | 0.51 | 0.46 | 0.42 | 0.41 | 0.42 | 0.47 | 0.57 | 0.68 | 0.80 | 0.90 | 0.99 | 1.07 | 1.13 | | | | |
| 0° | | | | 0.73 | 0.67 | 0.61 | 0.57 | 0.55 | 0.56 | 0.61 | 0.70 | 0.82 | 0.94 | 1.05 | 1.14 | 1.22 | 1.29 | 1.35 | | | |
| L = 310° φ = 40° | | | | 0.13 | 0.10 | 0.08 | 0.08 | 0.10 | 0.14 | 0.20 | 0.28 | 0.36 | 0.45 | 0.52 | 0.59 | 0.65 | | | | | |
| 30° | | | | 0.23 | 0.19 | 0.16 | 0.16 | 0.17 | 0.22 | 0.29 | 0.38 | 0.48 | 0.58 | 0.67 | 0.74 | 0.81 | 0.86 | | | | |
| 20° | | | | 0.36 | 0.32 | 0.28 | 0.27 | 0.27 | 0.32 | 0.40 | 0.50 | 0.61 | 0.73 | 0.83 | 0.91 | 0.97 | 1.03 | | | | |
| 10° | | | | 0.51 | 0.46 | 0.42 | 0.40 | 0.40 | 0.44 | 0.52 | 0.62 | 0.75 | 0.87 | 0.98 | 1.06 | 1.13 | 1.19 | 1.33 | | | |
| 0° | | | | 0.67 | 0.61 | 0.57 | 0.55 | 0.54 | 0.57 | 0.65 | 0.75 | 0.88 | 1.00 | 1.11 | 1.20 | 1.29 | 1.34 | 1.39 | | | |

# TABLE B.

| λ + μ. | 260° | 270° | 280° | 290° | 300° | 310° | 320° | 330° | 340° | 350° | 0° | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° | 100° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L = 320° φ = 40° | | | | 0.10 | 0.08 | 0.07 | 0.09 | 0.12 | 0.17 | 0.24 | 0.33 | 0.42 | 0.50 | 0.58 | 0.64 | 0.69 | 0.73 | | | | |
| 30° | | | | 0.19 | 0.17 | 0.15 | 0.16 | 0.19 | 0.25 | 0.34 | 0.44 | 0.54 | 0.64 | 0.72 | 0.80 | 0.86 | 0.90 | | | | |
| 20° | | | | 0.32 | 0.29 | 0.26 | 0.26 | 0.29 | 0.35 | 0.44 | 0.55 | 0.68 | 0.79 | 0.87 | 0.98 | 1.03 | 1.07 | | | | |
| 10° | | | | 0.46 | 0.42 | 0.39 | 0.36 | 0.40 | 0.46 | 0.56 | 0.67 | 0.81 | 0.93 | 1.03 | 1.12 | 1.19 | 1.24 | 1.26 | | | |
| 0° | | | | 0.62 | 0.57 | 0.54 | 0.53 | 0.54 | 0.59 | 0.68 | 0.80 | 0.93 | 1.06 | 1.15 | 1.27 | 1.33 | 1.39 | 1.43 | | | |
| L = 330° φ = 40° | | | | 0.08 | 0.07 | 0.08 | 0.10 | 0.15 | 0.21 | 0.29 | 0.38 | 0.47 | 0.56 | 0.63 | 0.69 | 0.74 | 0.77 | | | | |
| 30° | | | | 0.17 | 0.15 | 0.15 | 0.17 | 0.22 | 0.29 | 0.39 | 0.50 | 0.60 | 0.70 | 0.79 | 0.85 | 0.90 | 0.94 | | | | |
| 20° | | | | 0.28 | 0.26 | 0.25 | 0.27 | 0.31 | 0.39 | 0.49 | 0.62 | 0.74 | 0.85 | 0.95 | 1.02 | 1.07 | 1.11 | | | | |
| 10° | | | | 0.42 | 0.39 | 0.38 | 0.39 | 0.42 | 0.49 | 0.60 | 0.74 | 0.87 | 0.99 | 1.10 | 1.17 | 1.23 | 1.28 | 1.30 | | | |
| 0° | | | | 0.57 | 0.54 | 0.52 | 0.52 | 0.56 | 0.62 | 0.72 | 0.86 | 0.99 | 1.12 | 1.23 | 1.32 | 1.38 | 1.43 | 1.46 | | | |
| L = 340° φ = 40° | | | 0.08 | 0.07 | 0.07 | 0.09 | 0.13 | 0.18 | 0.26 | 0.34 | 0.44 | 0.53 | 0.61 | 0.68 | 0.73 | 0.78 | 0.80 | | | | |
| 30° | | | 0.17 | 0.16 | 0.15 | 0.16 | 0.20 | 0.26 | 0.34 | 0.44 | 0.54 | 0.66 | 0.76 | 0.84 | 0.90 | 0.95 | 0.97 | | | | |
| 20° | | | | 0.26 | 0.25 | 0.26 | 0.29 | 0.34 | 0.43 | 0.54 | 0.68 | 0.80 | 0.90 | 1.00 | 1.06 | 1.11 | 1.14 | 1.16 | | | |
| 10° | | | | 0.39 | 0.37 | 0.37 | 0.39 | 0.44 | 0.53 | 0.65 | 0.79 | 0.93 | 1.04 | 1.15 | 1.22 | 1.27 | 1.30 | 1.32 | | | |
| 0° | | | | 0.53 | 0.51 | 0.51 | 0.53 | 0.57 | 0.66 | 0.77 | 0.90 | 1.04 | 1.18 | 1.28 | 1.36 | 1.41 | 1.45 | 1.47 | | | |
| L = 350° φ = 40° | | | 0.06 | 0.06 | 0.08 | 0.10 | 0.15 | 0.21 | 0.29 | 0.39 | 0.48 | 0.57 | 0.65 | 0.72 | 0.76 | 0.79 | 0.81 | 0.81 | | | |
| 30° | | | 0.15 | 0.14 | 0.15 | 0.17 | 0.22 | 0.29 | 0.36 | 0.48 | 0.60 | 0.71 | 0.80 | 0.88 | 0.93 | 0.96 | 0.98 | 0.99 | | | |
| 20° | | | 0.26 | 0.25 | 0.25 | 0.26 | 0.31 | 0.38 | 0.46 | 0.59 | 0.72 | 0.84 | 0.95 | 1.04 | 1.09 | 1.13 | 1.15 | 1.16 | | | |
| 10° | | | | 0.37 | 0.37 | 0.38 | 0.42 | 0.49 | 0.57 | 0.70 | 0.84 | 0.98 | 1.09 | 1.19 | 1.25 | 1.29 | 1.32 | 1.33 | | | |
| 0° | | | | 0.52 | 0.51 | 0.52 | 0.55 | 0.61 | 0.70 | 0.82 | 0.96 | 1.10 | 1.23 | 1.33 | 1.40 | 1.45 | 1.48 | 1.49 | | | |
| L = 360° φ = 40° | | 0.05 | 0.07 | 0.08 | 0.10 | 0.13 | 0.19 | 0.25 | 0.33 | 0.43 | 0.53 | 0.61 | 0.69 | 0.74 | 0.78 | 0.81 | 0.89 | 0.92 | | | |
| 30° | | | 0.14 | 0.14 | 0.16 | 0.19 | 0.24 | 0.32 | 0.41 | 0.53 | 0.65 | 0.75 | 0.84 | 0.90 | 0.95 | 0.98 | 0.99 | 0.99 | | | |
| 20° | | | 0.24 | 0.24 | 0.25 | 0.28 | 0.34 | 0.41 | 0.51 | 0.63 | 0.77 | 0.89 | 0.99 | 1.07 | 1.12 | 1.15 | 1.16 | 1.16 | | | |
| 10° | | | | 0.37 | 0.38 | 0.40 | 0.44 | 0.51 | 0.62 | 0.73 | 0.88 | 1.02 | 1.15 | 1.23 | 1.28 | 1.31 | 1.33 | 1.33 | | | |
| 0° | | | | 0.51 | 0.51 | 0.53 | 0.57 | 0.64 | 0.74 | 0.85 | 1.00 | 1.15 | 1.26 | 1.36 | 1.43 | 1.47 | 1.49 | 1.49 | | | |
| L = 400° φ = 40° | | | 0.15 | 0.15 | 0.16 | 0.18 | 0.21 | 0.25 | 0.30 | 0.36 | 0.42 | 0.48 | 0.54 | 0.57 | 0.60 | 0.62 | 0.62 | 0.62 | | | |
| 30° | | | 0.24 | 0.24 | 0.26 | 0.28 | 0.31 | 0.35 | 0.41 | 0.48 | 0.56 | 0.63 | 0.69 | 0.73 | 0.76 | 0.78 | 0.79 | 0.79 | | | |
| 20° | | | | 0.39 | 0.39 | 0.41 | 0.44 | 0.48 | 0.54 | 0.62 | 0.70 | 0.79 | 0.86 | 0.90 | 0.94 | 0.96 | 0.97 | 0.97 | | | |
| 10° | | | | 0.53 | 0.53 | 0.54 | 0.57 | 0.61 | 0.68 | 0.76 | 0.85 | 0.94 | 1.02 | 1.07 | 1.11 | 1.13 | 1.14 | 1.14 | | | |
| 0° | | | | 0.69 | 0.69 | 0.70 | 0.72 | 0.74 | 0.82 | 0.95 | 1.00 | 1.09 | 1.18 | 1.23 | 1.27 | 1.29 | 1.31 | 1.31 | | | |
| L = 410° φ = 40° | | | 0.15 | 0.16 | 0.18 | 0.21 | 0.24 | 0.29 | 0.34 | 0.40 | 0.47 | 0.53 | 0.57 | 0.60 | 0.62 | 0.63 | 0.63 | 0.62 | | | |
| 30° | | | 0.26 | 0.26 | 0.28 | 0.30 | 0.34 | 0.40 | 0.45 | 0.53 | 0.60 | 0.67 | 0.73 | 0.77 | 0.79 | 0.79 | 0.79 | 0.78 | | | |
| 20° | | | | 0.39 | 0.41 | 0.43 | 0.47 | 0.52 | 0.59 | 0.67 | 0.76 | 0.83 | 0.90 | 0.94 | 0.96 | 0.97 | 0.96 | 0.95 | | | |
| 10° | | | | 0.53 | 0.54 | 0.57 | 0.60 | 0.66 | 0.73 | 0.82 | 0.91 | 0.99 | 1.06 | 1.11 | 1.13 | 1.14 | 1.13 | 1.12 | | | |
| 0° | | | | 0.69 | 0.70 | 0.72 | 0.76 | 0.81 | 0.88 | 0.97 | 1.06 | 1.15 | 1.22 | 1.27 | 1.30 | 1.31 | 1.31 | 1.30 | | | |
| L = 420° φ = 40° | | 0.16 | 0.17 | 0.19 | 0.21 | 0.25 | 0.29 | 0.34 | 0.40 | 0.46 | 0.52 | 0.57 | 0.61 | 0.63 | 0.64 | 0.63 | 0.62 | 0.60 | 0.58 | | |
| 30° | | | 0.27 | 0.28 | 0.31 | 0.34 | 0.39 | 0.45 | 0.52 | 0.59 | 0.66 | 0.72 | 0.77 | 0.80 | 0.80 | 0.80 | 0.78 | 0.76 | | | |
| 20° | | | 0.39 | 0.40 | 0.43 | 0.46 | 0.51 | 0.57 | 0.65 | 0.73 | 0.81 | 0.88 | 0.94 | 0.97 | 0.97 | 0.97 | 0.95 | 0.92 | | | |
| 10° | | | | 0.54 | 0.56 | 0.60 | 0.65 | 0.71 | 0.78 | 0.87 | 0.97 | 1.05 | 1.11 | 1.14 | 1.14 | 1.14 | 1.12 | 1.09 | | | |
| 0° | | | | 0.70 | 0.72 | 0.75 | 0.80 | 0.86 | 0.93 | 1.02 | 1.12 | 1.20 | 1.27 | 1.30 | 1.31 | 1.31 | 1.29 | 1.27 | | | |

# TABLE B.

| λ + μ | 260° | 270° | 280° | 290° | 300° | 310° | 320° | 330° | 340° | 350° | 0° | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° | 100° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L. = 430° ϕ = 40° | | 0.16 | 0.18 | 0.20 | 0.24 | 0.28 | 0.33 | 0.39 | 0.44 | 0.51 | 0.56 | 0.60 | 0.63 | 0.64 | 0.64 | 0.63 | 0.61 | 0.58 | 0.55 | | |
| 30° | | | 0.28 | 0.30 | 0.34 | 0.38 | 0.43 | 0.50 | 0.57 | 0.64 | 0.71 | 0.76 | 0.80 | 0.81 | 0.80 | 0.79 | 0.76 | 0.73 | 0.70 | | |
| 20° | | | 0.40 | 0.43 | 0.46 | 0.50 | 0.55 | 0.62 | 0.70 | 0.78 | 0.86 | 0.92 | 0.97 | 0.98 | 0.97 | 0.95 | 0.92 | 0.89 | | | |
| 10° | | | | 0.56 | 0.59 | 0.64 | 0.69 | 0.77 | 0.85 | 0.93 | 1.02 | 1.09 | 1.14 | 1.15 | 1.14 | 1.12 | 1.09 | 1.06 | | | |
| 0° | | | | 0.73 | 0.75 | 0.80 | 0.85 | 0.92 | 1.00 | 1.09 | 1.18 | 1.25 | 1.30 | 1.32 | 1.31 | 1.29 | 1.27 | 1.23 | | | |
| L. = 440° ϕ = 40° | | 0.19 | 0.21 | 0.24 | 0.28 | 0.33 | 0.39 | 0.44 | 0.50 | 0.56 | 0.61 | 0.64 | 0.66 | 0.66 | 0.64 | 0.62 | 0.59 | 0.56 | 0.52 | | |
| 30° | | | 0.30 | 0.34 | 0.38 | 0.43 | 0.49 | 0.55 | 0.62 | 0.70 | 0.76 | 0.80 | 0.82 | 0.81 | 0.80 | 0.77 | 0.74 | 0.70 | 0.65 | | |
| 20° | | | 0.42 | 0.46 | 0.50 | 0.55 | 0.61 | 0.68 | 0.76 | 0.85 | 0.91 | 0.97 | 0.99 | 0.98 | 0.97 | 0.93 | 0.90 | 0.85 | | | |
| 10° | | | | 0.60 | 0.64 | 0.69 | 0.75 | 0.83 | 0.91 | 1.00 | 1.08 | 1.14 | 1.16 | 1.16 | 1.14 | 1.10 | 1.06 | 1.02 | | | |
| 0° | | | | 0.73 | 0.79 | 0.84 | 0.90 | 0.98 | 1.07 | 1.15 | 1.24 | 1.30 | 1.33 | 1.35 | 1.31 | 1.27 | 1.23 | 1.19 | | | |
| L. = 450° ϕ = 40° | | 0.21 | 0.24 | 0.28 | 0.32 | 0.37 | 0.43 | 0.48 | 0.54 | 0.60 | 0.64 | 0.67 | 0.67 | 0.66 | 0.63 | 0.60 | 0.56 | 0.52 | 0.48 | 0.44 | |
| 30° | | 0.30 | 0.33 | 0.37 | 0.42 | 0.48 | 0.54 | 0.61 | 0.68 | 0.74 | 0.80 | 0.83 | 0.83 | 0.82 | 0.78 | 0.74 | 0.70 | 0.65 | 0.61 | | |
| 20° | | | 0.46 | 0.50 | 0.55 | 0.61 | 0.67 | 0.75 | 0.82 | 0.90 | 0.96 | 1.00 | 1.00 | 0.99 | 0.95 | 0.91 | 0.86 | 0.81 | 0.76 | | |
| 10° | | | | 0.64 | 0.69 | 0.75 | 0.82 | 0.89 | 0.97 | 1.06 | 1.13 | 1.17 | 1.18 | 1.16 | 1.12 | 1.08 | 1.02 | 0.97 | | | |
| 0° | | | | 0.79 | 0.84 | 0.90 | 0.98 | 1.05 | 1.14 | 1.22 | 1.30 | 1.34 | 1.35 | 1.33 | 1.29 | 1.25 | 1.19 | 1.14 | | | |
| L. = 460° ϕ = 40° | 0.21 | 0.24 | 0.28 | 0.32 | 0.37 | 0.42 | 0.48 | 0.53 | 0.59 | 0.64 | 0.67 | 0.68 | 0.68 | 0.65 | 0.62 | 0.58 | 0.53 | 0.48 | 0.43 | 0.39 | |
| 30° | | 0.34 | 0.37 | 0.42 | 0.47 | 0.54 | 0.60 | 0.67 | 0.73 | 0.79 | 0.84 | 0.85 | 0.84 | 0.81 | 0.77 | 0.72 | 0.66 | 0.61 | 0.56 | | |
| 20° | | | 0.50 | 0.55 | 0.60 | 0.66 | 0.74 | 0.81 | 0.89 | 0.96 | 1.01 | 1.03 | 1.01 | 0.98 | 0.93 | 0.87 | 0.81 | 0.75 | 0.70 | | |
| 10° | | | | 0.69 | 0.75 | 0.81 | 0.89 | 0.96 | 1.05 | 1.12 | 1.18 | 1.20 | 1.19 | 1.15 | 1.09 | 1.04 | 0.98 | 0.91 | | | |
| 0° | | | | 0.84 | 0.90 | 0.96 | 1.04 | 1.12 | 1.21 | 1.28 | 1.34 | 1.36 | 1.35 | 1.31 | 1.26 | 1.20 | 1.14 | 1.07 | | | |
| L. = 470° ϕ = 40° | 0.24 | 0.28 | 0.33 | 0.37 | 0.43 | 0.48 | 0.53 | 0.58 | 0.64 | 0.68 | 0.70 | 0.69 | 0.67 | 0.64 | 0.59 | 0.54 | 0.48 | 0.43 | 0.39 | 0.34 | |
| 30° | | 0.39 | 0.44 | 0.49 | 0.55 | 0.61 | 0.67 | 0.73 | 0.79 | 0.84 | 0.87 | 0.86 | 0.84 | 0.79 | 0.73 | 0.67 | 0.61 | 0.56 | 0.50 | 0.45 | |
| 20° | | | 0.56 | 0.62 | 0.68 | 0.74 | 0.81 | 0.88 | 0.95 | 1.01 | 1.05 | 1.03 | 1.01 | 0.95 | 0.88 | 0.82 | 0.76 | 0.70 | 0.64 | | |
| 10° | | | | 0.75 | 0.81 | 0.88 | 0.96 | 1.03 | 1.11 | 1.18 | 1.21 | 1.20 | 1.17 | 1.11 | 1.04 | 0.97 | 0.91 | 0.84 | | | |
| 0° | | | | 0.91 | 0.97 | 1.03 | 1.11 | 1.19 | 1.27 | 1.34 | 1.37 | 1.37 | 1.33 | 1.27 | 1.20 | 1.13 | 1.06 | 1.00 | | | |
| L. = 480° ϕ = 40° | 0.29 | 0.33 | 0.38 | 0.43 | 0.48 | 0.53 | 0.59 | 0.64 | 0.68 | 0.71 | 0.71 | 0.70 | 0.66 | 0.61 | 0.55 | 0.50 | 0.44 | 0.39 | 0.34 | 0.29 | 0.26 |
| 30° | | 0.44 | 0.49 | 0.55 | 0.61 | 0.67 | 0.73 | 0.79 | 0.85 | 0.88 | 0.89 | 0.87 | 0.82 | 0.76 | 0.69 | 0.62 | 0.57 | 0.50 | 0.44 | 0.40 | |
| 20° | | | 0.61 | 0.67 | 0.74 | 0.81 | 0.88 | 0.95 | 1.01 | 1.05 | 1.06 | 1.03 | 0.98 | 0.91 | 0.84 | 0.76 | 0.69 | 0.62 | 0.57 | | |
| 10° | | | | 0.82 | 0.89 | 0.96 | 1.04 | 1.11 | 1.17 | 1.22 | 1.23 | 1.20 | 1.14 | 1.07 | 0.99 | 0.92 | 0.84 | 0.77 | | | |
| 0° | | | | 0.98 | 1.04 | 1.12 | 1.19 | 1.27 | 1.33 | 1.38 | 1.40 | 1.37 | 1.30 | 1.22 | 1.14 | 1.07 | 0.99 | 0.92 | | | |
| L. = 490° ϕ = 40° | 0.33 | 0.38 | 0.43 | 0.48 | 0.54 | 0.58 | 0.64 | 0.68 | 0.72 | 0.73 | 0.72 | 0.70 | 0.65 | 0.58 | 0.52 | 0.46 | 0.40 | 0.35 | 0.29 | 0.25 | 0.21 |
| 30° | | 0.49 | 0.55 | 0.61 | 0.66 | 0.73 | 0.78 | 0.84 | 0.88 | 0.91 | 0.90 | 0.86 | 0.80 | 0.72 | 0.65 | 0.57 | 0.51 | 0.45 | 0.39 | 0.34 | |
| 20° | | | 0.68 | 0.74 | 0.81 | 0.87 | 0.95 | 1.06 | 1.06 | 1.08 | 1.07 | 1.02 | 0.95 | 0.86 | 0.78 | 0.70 | 0.63 | 0.57 | 0.52 | | |
| 10° | | | | 0.89 | 0.96 | 1.03 | 1.10 | 1.17 | 1.22 | 1.25 | 1.23 | 1.18 | 1.10 | 1.01 | 0.93 | 0.84 | 0.76 | 0.71 | | | |
| 0° | | | | 1.05 | 1.12 | 1.19 | 1.26 | 1.33 | 1.38 | 1.41 | 1.39 | 1.34 | 1.26 | 1.17 | 1.08 | 0.99 | 0.92 | 0.85 | | | |
| L. = 500° ϕ = 40° | | 0.43 | 0.48 | 0.53 | 0.58 | 0.63 | 0.68 | 0.72 | 0.74 | 0.74 | 0.72 | 0.68 | 0.62 | 0.55 | 0.48 | 0.41 | 0.35 | 0.29 | 0.25 | 0.20 | 0.17 |
| 30° | | | 0.61 | 0.67 | 0.72 | 0.78 | 0.84 | 0.88 | 0.91 | 0.92 | 0.89 | 0.83 | 0.76 | 0.68 | 0.60 | 0.52 | 0.46 | 0.40 | 0.34 | 0.30 | |
| 20° | | | 0.75 | 0.81 | 0.87 | 0.94 | 1.00 | 1.05 | 1.08 | 1.09 | 1.05 | 0.99 | 0.90 | 0.81 | 0.71 | 0.64 | 0.57 | 0.51 | 0.45 | | |
| 10° | | | | 0.96 | 1.03 | 1.10 | 1.16 | 1.22 | 1.25 | 1.26 | 1.22 | 1.14 | 1.04 | 0.95 | 0.86 | 0.77 | 0.70 | 0.63 | | | |
| 0° | | | | 1.13 | 1.19 | 1.26 | 1.33 | 1.38 | 1.42 | 1.43 | 1.37 | 1.29 | 1.19 | 1.09 | 1.00 | 0.92 | 0.84 | 0.78 | | | |

## TABLE B.

| λ ∓ μ | 260° | 270° | 280° | 290° | 300° | 310° | 320° | 330° | 340° | 350° | 0° | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° | 100° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L = 510° φ = 40° | | 0.49 | 0.54 | 0.59 | 0.65 | 0.69 | 0.73 | 0.76 | 0.77 | 0.75 | 0.72 | 0.67 | 0.59 | 0.52 | 0.44 | 0.38 | 0.32 | 0.26 | 0.21 | 0.17 | 0.14 |
| 30° | | | 0.67 | 0.73 | 0.79 | 0.84 | 0.89 | 0.92 | 0.94 | 0.92 | 0.88 | 0.80 | 0.72 | 0.63 | 0.54 | 0.47 | 0.41 | 0.35 | 0.30 | 0.26 | |
| 20° | | | 0.82 | 0.88 | 0.94 | 1.00 | 1.05 | 1.09 | 1.11 | 1.09 | 1.03 | 0.95 | 0.85 | 0.75 | 0.66 | 0.57 | 0.50 | 0.45 | 0.40 | | |
| 10° | | | | 1.05 | 1.11 | 1.17 | 1.23 | 1.26 | 1.28 | 1.26 | 1.19 | 1.10 | 0.99 | 0.88 | 0.79 | 0.71 | 0.64 | 0.58 | | | |
| 0° | | | | 1.21 | 1.28 | 1.34 | 1.39 | 1.43 | 1.44 | 1.42 | 1.35 | 1.24 | 1.14 | 1.03 | 0.93 | 0.85 | 0.77 | 0.72 | | | |
| L = 520° φ = 40° | | 0.54 | 0.59 | 0.64 | 0.69 | 0.73 | 0.76 | 0.78 | 0.78 | 0.76 | 0.70 | 0.63 | 0.56 | 0.49 | 0.40 | 0.33 | 0.27 | 0.21 | 0.17 | 0.14 | 0.11 |
| 30° | | | 0.73 | 0.79 | 0.84 | 0.89 | 0.93 | 0.95 | 0.95 | 0.92 | 0.86 | 0.77 | 0.68 | 0.58 | 0.50 | 0.42 | 0.36 | 0.30 | 0.26 | 0.22 | |
| 20° | | | 0.88 | 0.94 | 1.00 | 1.05 | 1.10 | 1.12 | 1.11 | 1.08 | 1.01 | 0.91 | 0.80 | 0.70 | 0.60 | 0.52 | 0.45 | 0.40 | 0.36 | | |
| 10° | | | | 1.11 | 1.17 | 1.22 | 1.27 | 1.29 | 1.29 | 1.24 | 1.16 | 1.05 | 0.94 | 0.82 | 0.72 | 0.64 | 0.57 | 0.52 | 0.48 | | |
| 0° | | | | 1.27 | 1.33 | 1.38 | 1.43 | 1.45 | 1.44 | 1.39 | 1.30 | 1.18 | 1.06 | 0.95 | 0.86 | 0.78 | 0.71 | 0.65 | | | |
| L = 530° φ = 40° | | 0.59 | 0.64 | 0.69 | 0.73 | 0.76 | 0.78 | 0.79 | 0.77 | 0.74 | 0.68 | 0.60 | 0.52 | 0.43 | 0.35 | 0.29 | 0.22 | 0.17 | 0.14 | 0.11 | 0.09 |
| 30° | | | 0.79 | 0.84 | 0.89 | 0.93 | 0.96 | 0.96 | 0.95 | 0.90 | 0.83 | 0.73 | 0.63 | 0.54 | 0.44 | 0.37 | 0.30 | 0.26 | 0.22 | 0.19 | |
| 20° | | | | 1.00 | 1.06 | 1.10 | 1.13 | 1.13 | 1.12 | 1.07 | 0.97 | 0.86 | 0.74 | 0.64 | 0.54 | 0.47 | 0.40 | 0.35 | 0.31 | | |
| 10° | | | | 1.17 | 1.23 | 1.27 | 1.30 | 1.31 | 1.28 | 1.22 | 1.12 | 0.99 | 0.87 | 0.76 | 0.67 | 0.59 | 0.52 | 0.48 | 0.44 | | |
| 0° | | | | 1.33 | 1.39 | 1.43 | 1.45 | 1.46 | 1.43 | 1.35 | 1.25 | 1.12 | 1.00 | 0.89 | 0.80 | 0.71 | 0.66 | 0.61 | | | |
| L = 540° φ = 40° | | | 0.69 | 0.73 | 0.76 | 0.78 | 0.80 | 0.79 | 0.77 | 0.72 | 0.65 | 0.58 | 0.49 | 0.40 | 0.32 | 0.25 | 0.20 | 0.16 | 0.12 | 0.10 | 0.09 |
| 30° | | | 0.84 | 0.89 | 0.93 | 0.95 | 0.97 | 0.96 | 0.94 | 0.88 | 0.79 | 0.69 | 0.59 | 0.48 | 0.40 | 0.32 | 0.27 | 0.22 | 0.18 | 0.16 | |
| 20° | | | | 1.05 | 1.10 | 1.12 | 1.14 | 1.13 | 1.10 | 1.03 | 0.93 | 0.81 | 0.69 | 0.58 | 0.49 | 0.42 | 0.36 | 0.32 | 0.28 | | |
| 10° | | | | 1.22 | 1.27 | 1.30 | 1.32 | 1.31 | 1.26 | 1.19 | 1.07 | 0.94 | 0.82 | 0.70 | 0.61 | 0.54 | 0.48 | 0.43 | 0.41 | | |
| 0° | | | | 1.38 | 1.43 | 1.46 | 1.47 | 1.46 | 1.41 | 1.32 | 1.20 | 1.07 | 0.94 | 0.82 | 0.73 | 0.67 | 0.61 | 0.57 | | | |
| L = 550° φ = 40° | | | 0.73 | 0.77 | 0.80 | 0.81 | 0.81 | 0.80 | 0.74 | 0.70 | 0.63 | 0.54 | 0.45 | 0.36 | 0.28 | 0.22 | 0.16 | 0.13 | 0.10 | 0.08 | |
| 30° | | | | 0.89 | 0.93 | 0.96 | 0.98 | 0.97 | 0.92 | 0.86 | 0.76 | 0.65 | 0.55 | 0.44 | 0.36 | 0.29 | 0.23 | 0.19 | 0.17 | 0.15 | |
| 20° | | | | 1.10 | 1.13 | 1.16 | 1.16 | 1.14 | 1.08 | 1.00 | 0.89 | 0.77 | 0.65 | 0.53 | 0.44 | 0.35 | 0.33 | 0.29 | 0.26 | | |
| 10° | | | | 1.27 | 1.30 | 1.32 | 1.32 | 1.29 | 1.24 | 1.14 | 1.02 | 0.89 | 0.76 | 0.65 | 0.56 | 0.49 | 0.44 | 0.41 | 0.39 | | |
| 0° | | | | 1.43 | 1.46 | 1.48 | 1.48 | 1.44 | 1.38 | 1.26 | 1.14 | 1.01 | 0.88 | 0.77 | 0.68 | 0.62 | 0.57 | 0.54 | | | |
| L = 560° φ = 40° | | | 0.76 | 0.79 | 0.80 | 0.81 | 0.80 | 0.78 | 0.74 | 0.67 | 0.59 | 0.50 | 0.41 | 0.32 | 0.25 | 0.18 | 0.13 | 0.10 | 0.08 | 0.07 | |
| 30° | | | | 0.95 | 0.97 | 0.98 | 0.97 | 0.95 | 0.90 | 0.81 | 0.72 | 0.60 | 0.49 | 0.39 | 0.31 | 0.24 | 0.20 | 0.17 | 0.15 | 0.14 | |
| 20° | | | | 1.13 | 1.15 | 1.14 | 1.15 | 1.12 | 1.06 | 0.96 | 0.84 | 0.72 | 0.59 | 0.49 | 0.40 | 0.34 | 0.29 | 0.26 | 0.25 | | |
| 10° | | | | 1.30 | 1.32 | 1.33 | 1.31 | 1.28 | 1.20 | 1.09 | 0.97 | 0.83 | 0.70 | 0.60 | 0.51 | 0.44 | 0.41 | 0.38 | | | |
| 0° | | | | 1.47 | 1.49 | 1.49 | 1.47 | 1.43 | 1.34 | 1.23 | 1.10 | 0.96 | 0.82 | 0.78 | 0.64 | 0.59 | 0.55 | 0.53 | | | |
| L = 570° φ = 40° | | | | 0.81 | 0.82 | 0.82 | 0.80 | 0.77 | 0.72 | 0.64 | 0.55 | 0.46 | 0.37 | 0.28 | 0.21 | 0.16 | 0.11 | 0.08 | 0.07 | 0.07 | |
| 30° | | | | 0.98 | 0.99 | 0.99 | 0.97 | 0.93 | 0.87 | 0.79 | 0.68 | 0.57 | 0.46 | 0.36 | 0.29 | 0.22 | 0.18 | 0.15 | 0.14 | | |
| 20° | | | | 1.15 | 1.16 | 1.16 | 1.15 | 1.10 | 1.03 | 0.93 | 0.81 | 0.68 | 0.56 | 0.45 | 0.37 | 0.31 | 0.27 | 0.26 | 0.25 | | |
| 10° | | | | 1.32 | 1.33 | 1.33 | 1.30 | 1.25 | 1.17 | 1.06 | 0.93 | 0.79 | 0.66 | 0.55 | 0.47 | 0.42 | 0.39 | 0.37 | 0.37 | | |
| 0° | | | | 1.48 | 1.49 | 1.48 | 1.45 | 1.39 | 1.30 | 1.18 | 1.04 | 0.90 | 0.77 | 0.67 | 0.60 | 0.55 | 0.52 | 0.51 | | | |
| L = 580° φ = 40° | | | | 0.82 | 0.82 | 0.81 | 0.78 | 0.74 | 0.69 | 0.61 | 0.53 | 0.43 | 0.33 | 0.25 | 0.18 | 0.13 | 0.10 | 0.08 | 0.07 | 0.08 | |
| 30° | | | | 0.99 | 0.99 | 0.98 | 0.95 | 0.90 | 0.84 | 0.75 | 0.65 | 0.53 | 0.41 | 0.32 | 0.24 | 0.19 | 0.16 | 0.14 | 0.14 | | |
| 20° | | | | 1.16 | 1.16 | 1.15 | 1.12 | 1.07 | 0.99 | 0.89 | 0.77 | 0.63 | 0.51 | 0.41 | 0.34 | 0.28 | 0.25 | 0.24 | 0.24 | | |
| 10° | | | | 1.33 | 1.33 | 1.31 | 1.28 | 1.23 | 1.13 | 1.02 | 0.88 | 0.73 | 0.62 | 0.51 | 0.44 | 0.40 | 0.38 | 0.37 | | | |
| 0° | | | | 1.49 | 1.48 | 1.47 | 1.43 | 1.36 | 1.26 | 1.16 | 1.00 | 0.85 | 0.71 | 0.61 | 0.57 | 0.53 | 0.51 | 0.51 | | | |

# TABLE B.

| $\lambda + \mu$ | 260° | 270° | 280° | 290° | 300° | 310° | 320° | 330° | 340° | 350° | 0° | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° | 100° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L = 590° $\phi$ = 40° | | | | 0.82 | 0.81 | 0.79 | 0.76 | 0.72 | 0.65 | 0.58 | 0.49 | 0.39 | 0.29 | 0.22 | 0.15 | 0.10 | 0.08 | 0.07 | 0.07 | | |
| 30° | | | | 0.99 | 0.98 | 0.96 | 0.93 | 0.88 | 0.80 | 0.71 | 0.60 | 0.48 | 0.37 | 0.29 | 0.22 | 0.18 | 0.15 | 0.14 | 0.13 | | |
| 20° | | | | 1.16 | 1.15 | 1.13 | 1.10 | 1.04 | 0.95 | 0.84 | 0.72 | 0.59 | 0.47 | 0.37 | 0.31 | 0.26 | 0.25 | 0.25 | 0.26 | | |
| 10° | | | | 1.33 | 1.32 | 1.29 | 1.25 | 1.19 | 1.09 | 0.97 | 0.84 | 0.70 | 0.57 | 0.48 | 0.42 | 0.38 | 0.37 | 0.37 | | | |
| 0° | | | | 1.49 | 1.48 | 1.45 | 1.40 | 1.32 | 1.22 | 1.10 | 0.96 | 0.81 | 0.69 | 0.61 | 0.55 | 0.52 | 0.51 | 0.52 | | | |
| L = 600° $\phi$ = 40° | | | | | 0.80 | 0.77 | 0.73 | 0.68 | 0.61 | 0.53 | 0.44 | 0.34 | 0.26 | 0.18 | 0.13 | 0.09 | 0.07 | 0.07 | 0.08 | | |
| 30° | | | | | 0.97 | 0.94 | 0.89 | 0.83 | 0.75 | 0.65 | 0.55 | 0.44 | 0.34 | 0.25 | 0.19 | 0.16 | 0.14 | 0.14 | 0.17 | | |
| 20° | | | | 1.16 | 1.14 | 1.11 | 1.06 | 0.99 | 0.90 | 0.79 | 0.67 | 0.54 | 0.43 | 0.34 | 0.28 | 0.25 | 0.25 | 0.25 | | | |
| 10° | | | | 1.32 | 1.30 | 1.27 | 1.22 | 1.14 | 1.05 | 0.92 | 0.79 | 0.65 | 0.52 | 0.44 | 0.40 | 0.37 | 0.37 | 0.39 | | | |
| 0° | | | | 1.48 | 1.46 | 1.42 | 1.36 | 1.28 | 1.18 | 1.05 | 0.91 | 0.78 | 0.66 | 0.58 | 0.54 | 0.52 | 0.52 | 0.54 | | | |
| L = 610° $\phi$ = 40° | | | | | 0.78 | 0.75 | 0.69 | 0.63 | 0.57 | 0.48 | 0.39 | 0.30 | 0.22 | 0.16 | 0.11 | 0.08 | 0.08 | 0.08 | | | |
| 30° | | | | | 0.94 | 0.91 | 0.86 | 0.79 | 0.71 | 0.61 | 0.50 | 0.39 | 0.29 | 0.23 | 0.18 | 0.15 | 0.15 | 0.17 | | | |
| 20° | | | | | 1.11 | 1.08 | 1.02 | 0.94 | 0.85 | 0.74 | 0.62 | 0.50 | 0.39 | 0.30 | 0.27 | 0.26 | 0.26 | 0.28 | | | |
| 10° | | | | 1.30 | 1.28 | 1.23 | 1.17 | 1.10 | 0.99 | 0.87 | 0.75 | 0.60 | 0.49 | 0.42 | 0.39 | 0.38 | 0.39 | 0.42 | | | |
| 0° | | | | 1.46 | 1.43 | 1.37 | 1.31 | 1.23 | 1.12 | 0.99 | 0.85 | 0.72 | 0.62 | 0.56 | 0.52 | 0.52 | 0.54 | 0.57 | | | |
| L = 620° $\phi$ = 40° | | | | | 0.78 | 0.70 | 0.65 | 0.58 | 0.51 | 0.42 | 0.34 | 0.25 | 0.18 | 0.12 | 0.09 | 0.08 | 0.08 | 0.10 | | | |
| 30° | | | | | 0.90 | 0.86 | 0.80 | 0.72 | 0.64 | 0.54 | 0.44 | 0.34 | 0.25 | 0.19 | 0.16 | 0.15 | 0.17 | 0.19 | | | |
| 20° | | | | | 1.07 | 1.03 | 0.96 | 0.88 | 0.79 | 0.67 | 0.55 | 0.44 | 0.34 | 0.28 | 0.25 | 0.25 | 0.28 | 0.33 | | | |
| 10° | | | | 1.28 | 1.24 | 1.20 | 1.12 | 1.04 | 0.94 | 0.81 | 0.67 | 0.56 | 0.46 | 0.41 | 0.39 | 0.40 | 0.43 | 0.48 | | | |
| 0° | | | | 1.42 | 1.39 | 1.33 | 1.26 | 1.18 | 1.07 | 0.93 | 0.81 | 0.68 | 0.59 | 0.55 | 0.52 | 0.53 | 0.57 | 0.61 | | | |
| L = 630° $\phi$ = 40° | | | | | | 0.65 | 0.59 | 0.52 | 0.45 | 0.36 | 0.27 | 0.20 | 0.14 | 0.10 | 0.08 | 0.08 | 0.10 | 0.13 | | | |
| 30° | | | | | 0.87 | 0.81 | 0.75 | 0.67 | 0.59 | 0.48 | 0.38 | 0.30 | 0.22 | 0.18 | 0.16 | 0.17 | 0.19 | 0.23 | | | |
| 20° | | | | | 1.03 | 0.97 | 0.91 | 0.83 | 0.73 | 0.63 | 0.50 | 0.39 | 0.32 | 0.27 | 0.26 | 0.28 | 0.31 | 0.36 | | | |
| 10° | | | | 1.24 | 1.20 | 1.14 | 1.06 | 0.98 | 0.87 | 0.75 | 0.62 | 0.51 | 0.44 | 0.40 | 0.40 | 0.42 | 0.46 | 0.51 | | | |
| 0° | | | | 1.39 | 1.34 | 1.29 | 1.20 | 1.11 | 1.00 | 0.88 | 0.76 | 0.65 | 0.57 | 0.54 | 0.55 | 0.57 | 0.61 | 0.67 | | | |
| L = 640° $\phi$ = 40° | | | | | | 0.59 | 0.53 | 0.46 | 0.39 | 0.31 | 0.23 | 0.16 | 0.11 | 0.09 | 0.08 | 0.10 | 0.13 | | | | |
| 30° | | | | | 0.81 | 0.76 | 0.69 | 0.61 | 0.52 | 0.42 | 0.33 | 0.25 | 0.19 | 0.17 | 0.18 | 0.20 | 0.24 | 0.29 | | | |
| 20° | | | | | 0.97 | 0.91 | 0.83 | 0.75 | 0.65 | 0.54 | 0.44 | 0.35 | 0.29 | 0.27 | 0.28 | 0.31 | 0.37 | 0.42 | | | |
| 10° | | | | | 1.13 | 1.07 | 0.99 | 0.90 | 0.80 | 0.68 | 0.57 | 0.48 | 0.42 | 0.40 | 0.42 | 0.46 | 0.51 | 0.57 | | | |
| 0° | | | | 1.34 | 1.28 | 1.21 | 1.13 | 1.04 | 0.93 | 0.82 | 0.70 | 0.61 | 0.56 | 0.55 | 0.56 | 0.61 | 0.66 | 0.73 | | | |
| L = 650° $\phi$ = 40° | | | | | | 0.54 | 0.47 | 0.40 | 0.33 | 0.26 | 0.18 | 0.13 | 0.10 | 0.09 | 0.11 | 0.13 | 0.17 | | | | |
| 30° | | | | | 0.75 | 0.69 | 0.62 | 0.54 | 0.45 | 0.36 | 0.28 | 0.22 | 0.19 | 0.18 | 0.20 | 0.24 | 0.29 | | | | |
| 20° | | | | | 0.91 | 0.84 | 0.77 | 0.68 | 0.58 | 0.48 | 0.39 | 0.31 | 0.28 | 0.29 | 0.31 | 0.36 | 0.42 | | | | |
| 10° | | | | | 1.06 | 1.00 | 0.92 | 0.83 | 0.72 | 0.62 | 0.52 | 0.45 | 0.41 | 0.42 | 0.46 | 0.51 | 0.58 | 0.64 | | | |
| 0° | | | | 1.28 | 1.22 | 1.16 | 1.07 | 0.98 | 0.87 | 0.76 | 0.66 | 0.59 | 0.56 | 0.58 | 0.62 | 0.67 | 0.78 | 0.80 | | | |
| L = 660° $\phi$ = 40° | | | | | | 0.46 | 0.40 | 0.33 | 0.26 | 0.19 | 0.15 | 0.11 | 0.09 | 0.11 | 0.13 | 0.17 | 0.22 | | | | |
| 30° | | | | | 0.68 | 0.61 | 0.54 | 0.47 | 0.39 | 0.30 | 0.24 | 0.19 | 0.19 | 0.21 | 0.25 | 0.30 | 0.35 | | | | |
| 20° | | | | | 0.88 | 0.77 | 0.68 | 0.60 | 0.51 | 0.42 | 0.35 | 0.30 | 0.29 | 0.31 | 0.37 | 0.43 | 0.49 | | | | |
| 10° | | | | | 1.00 | 0.92 | 0.84 | 0.75 | 0.65 | 0.56 | 0.47 | 0.44 | 0.42 | 0.46 | 0.51 | 0.57 | 0.65 | 0.71 | | | |
| 0° | | | | 1.22 | 1.15 | 1.08 | 0.99 | 0.90 | 0.80 | 0.70 | 0.62 | 0.58 | 0.58 | 0.62 | 0.67 | 0.73 | 0.80 | 0.87 | | | |

# TABLE B.

| λ + μ | 260° | 270° | 280° | 290° | 300° | 310° | 320° | 330° | 340° | 350° | 0° | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° | 100° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L = 670° ϕ = 40° | | | | | | 0.39 | 0.33 | 0.27 | 0.21 | 0.15 | 0.11 | 0.10 | 0.11 | 0.14 | 0.18 | 0.23 | 0.28 | | | | |
| 30° | | | | | 0.61 | 0.54 | 0.47 | 0.39 | 0.32 | 0.26 | 0.21 | 0.20 | 0.21 | 0.25 | 0.29 | 0.36 | 0.42 | | | | |
| 20° | | | | | 0.77 | 0.69 | 0.61 | 0.53 | 0.46 | 0.38 | 0.32 | 0.30 | 0.32 | 0.37 | 0.43 | 0.50 | 0.57 | | | | |
| 10° | | | | | 0.93 | 0.85 | 0.76 | 0.68 | 0.59 | 0.51 | 0.46 | 0.44 | 0.46 | 0.52 | 0.58 | 0.65 | 0.72 | 0.79 | | | |
| 0° | | | | 1.15 | 1.08 | 1.01 | 0.92 | 0.84 | 0.75 | 0.66 | 0.61 | 0.59 | 0.61 | 0.66 | 0.73 | 0.81 | 0.86 | 0.95 | | | |
| L = 680° ϕ = 40° | | | | | | 0.33 | 0.27 | 0.22 | 0.17 | 0.13 | 0.11 | 0.12 | 0.14 | 0.18 | 0.23 | 0.29 | 0.34 | | | | |
| 30° | | | | | 0.53 | 0.47 | 0.40 | 0.33 | 0.28 | 0.23 | 0.20 | 0.21 | 0.26 | 0.29 | 0.35 | 0.42 | 0.48 | | | | |
| 20° | | | | | 0.69 | 0.62 | 0.54 | 0.47 | 0.40 | 0.35 | 0.32 | 0.32 | 0.37 | 0.43 | 0.49 | 0.57 | 0.63 | | | | |
| 10° | | | | | 0.86 | 0.79 | 0.71 | 0.62 | 0.55 | 0.49 | 0.46 | 0.47 | 0.51 | 0.58 | 0.65 | 0.73 | 0.80 | | | | |
| 0° | | | | 1.08 | 1.02 | 0.95 | 0.86 | 0.78 | 0.70 | 0.64 | 0.61 | 0.62 | 0.67 | 0.74 | 0.81 | 0.89 | 0.96 | 1.03 | | | |
| L = 690° ϕ = 40° | | | | | 0.32 | 0.27 | 0.22 | 0.18 | 0.14 | 0.12 | 0.12 | 0.14 | 0.18 | 0.24 | 0.29 | 0.33 | | | | | |
| 30° | | | | | 0.46 | 0.40 | 0.34 | 0.29 | 0.24 | 0.21 | 0.22 | 0.25 | 0.29 | 0.36 | 0.42 | 0.49 | 0.55 | | | | |
| 20° | | | | | 0.62 | 0.55 | 0.48 | 0.42 | 0.37 | 0.34 | 0.34 | 0.37 | 0.43 | 0.51 | 0.58 | 0.64 | 0.71 | | | | |
| 10° | | | | | 0.77 | 0.71 | 0.64 | 0.56 | 0.51 | 0.47 | 0.47 | 0.50 | 0.57 | 0.65 | 0.73 | 0.80 | 0.86 | | | | |
| 0° | | | | 1.00 | 0.93 | 0.87 | 0.80 | 0.72 | 0.66 | 0.63 | 0.62 | 0.66 | 0.72 | 0.80 | 0.88 | 0.96 | 1.02 | 1.09 | | | |
| L = 700° ϕ = 40° | | | | | 0.27 | 0.22 | 0.18 | 0.15 | 0.13 | 0.13 | 0.15 | 0.19 | 0.24 | 0.29 | 0.35 | 0.41 | 0.46 | | | | |
| 30° | | | | | 0.40 | 0.33 | 0.30 | 0.25 | 0.22 | 0.22 | 0.25 | 0.29 | 0.35 | 0.42 | 0.49 | 0.55 | 0.61 | | | | |
| 20° | | | | | 0.55 | 0.49 | 0.43 | 0.38 | 0.35 | 0.34 | 0.37 | 0.42 | 0.49 | 0.57 | 0.64 | 0.71 | 0.77 | | | | |
| 10° | | | | 0.77 | 0.71 | 0.65 | 0.59 | 0.54 | 0.50 | 0.49 | 0.51 | 0.56 | 0.64 | 0.73 | 0.80 | 0.87 | 0.94 | | | | |
| 0° | | | | 0.93 | 0.87 | 0.81 | 0.75 | 0.69 | 0.65 | 0.64 | 0.66 | 0.71 | 0.80 | 0.88 | 0.96 | 1.03 | 1.09 | 1.15 | | | |
| L = 710° ϕ = 40° | | | | | 0.22 | 0.19 | 0.16 | 0.14 | 0.14 | 0.15 | 0.19 | 0.24 | 0.30 | 0.35 | 0.41 | 0.46 | 0.51 | | | | |
| 30° | | | | | 0.34 | 0.30 | 0.27 | 0.24 | 0.23 | 0.25 | 0.29 | 0.34 | 0.42 | 0.48 | 0.55 | 0.61 | 0.66 | | | | |
| 20° | | | | | 0.49 | 0.44 | 0.40 | 0.37 | 0.35 | 0.37 | 0.41 | 0.48 | 0.56 | 0.64 | 0.71 | 0.78 | 0.83 | | | | |
| 10° | | | | 0.70 | 0.65 | 0.59 | 0.55 | 0.51 | 0.49 | 0.50 | 0.56 | 0.62 | 0.71 | 0.80 | 0.87 | 0.94 | 1.00 | | | | |
| 0° | | | | 0.86 | 0.81 | 0.76 | 0.72 | 0.68 | 0.65 | 0.66 | 0.71 | 0.78 | 0.87 | 0.95 | 1.03 | 1.12 | 1.16 | 1.21 | | | |
| L = 720° ϕ = 40° | | | | 0.22 | 0.19 | 0.17 | 0.15 | 0.15 | 0.16 | 0.19 | 0.24 | 0.29 | 0.35 | 0.41 | 0.46 | 0.51 | 0.55 | | | | |
| 30° | | | | 0.34 | 0.30 | 0.27 | 0.25 | 0.24 | 0.25 | 0.28 | 0.34 | 0.40 | 0.47 | 0.55 | 0.61 | 0.66 | 0.70 | | | | |
| 20° | | | | 0.48 | 0.44 | 0.41 | 0.37 | 0.36 | 0.37 | 0.40 | 0.46 | 0.54 | 0.62 | 0.69 | 0.77 | 0.82 | 0.87 | | | | |
| 10° | | | | 0.65 | 0.61 | 0.57 | 0.53 | 0.51 | 0.52 | 0.55 | 0.61 | 0.69 | 0.78 | 0.86 | 0.94 | 0.99 | 1.05 | | | | |
| 0° | | | | 0.81 | 0.76 | 0.73 | 0.69 | 0.67 | 0.67 | 0.70 | 0.76 | 0.84 | 0.93 | 1.01 | 1.09 | 1.15 | 1.21 | 1.25 | | | |
| L = 730° ϕ = 40° | | | | 0.18 | 0.16 | 0.15 | 0.14 | 0.16 | 0.18 | 0.22 | 0.28 | 0.34 | 0.40 | 0.45 | 0.50 | 0.54 | 0.58 | | | | |
| 30° | | | | 0.30 | 0.28 | 0.26 | 0.25 | 0.25 | 0.28 | 0.33 | 0.39 | 0.47 | 0.54 | 0.60 | 0.66 | 0.70 | 0.74 | | | | |
| 20° | | | | 0.44 | 0.41 | 0.38 | 0.37 | 0.38 | 0.40 | 0.45 | 0.52 | 0.61 | 0.69 | 0.76 | 0.82 | 0.87 | 0.91 | | | | |
| 10° | | | | 0.59 | 0.56 | 0.52 | 0.51 | 0.51 | 0.54 | 0.58 | 0.66 | 0.75 | 0.84 | 0.92 | 0.98 | 1.04 | 1.07 | 1.11 | | | |
| 0° | | | | 0.76 | 0.72 | 0.70 | 0.68 | 0.67 | 0.69 | 0.74 | 0.81 | 0.91 | 1.00 | 1.08 | 1.14 | 1.20 | 1.24 | 1.27 | | | |
| L = 740° ϕ = 40° | | | | 0.17 | 0.15 | 0.15 | 0.16 | 0.18 | 0.22 | 0.27 | 0.33 | 0.39 | 0.45 | 0.50 | 0.54 | 0.58 | 0.60 | | | | |
| 30° | | | | 0.28 | 0.26 | 0.26 | 0.26 | 0.28 | 0.32 | 0.38 | 0.45 | 0.52 | 0.60 | 0.65 | 0.70 | 0.74 | 0.77 | | | | |
| 20° | | | | 0.40 | 0.38 | 0.37 | 0.37 | 0.39 | 0.43 | 0.50 | 0.58 | 0.66 | 0.75 | 0.81 | 0.87 | 0.90 | 0.93 | 0.96 | | | |
| 10° | | | | 0.56 | 0.54 | 0.52 | 0.52 | 0.53 | 0.58 | 0.64 | 0.72 | 0.81 | 0.90 | 0.97 | 1.03 | 1.07 | 1.10 | 1.13 | | | |
| 0° | | | | 0.73 | 0.70 | 0.69 | 0.68 | 0.69 | 0.73 | 0.79 | 0.87 | 0.97 | 1.06 | 1.14 | 1.19 | 1.24 | 1.27 | 1.29 | | | |

# TABLE B.

| $\lambda + \mu$ | 260° | 270° | 280° | 290° | 300° | 310° | 320° | 330° | 340° | 350° | 0° | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° | 100° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L. = 750° $\phi$ = 40° | | | 0.16 | 0.15 | 0.15 | 0.16 | 0.18 | 0.21 | 0.26 | 0.31 | 0.39 | 0.44 | 0.49 | 0.54 | 0.57 | 0.60 | 0.62 | 0.63 | | | |
| 30° | | | | 0.26 | 0.26 | 0.26 | 0.28 | 0.32 | 0.37 | 0.43 | 0.51 | 0.58 | 0.65 | 0.70 | 0.74 | 0.77 | 0.78 | 0.79 | | | |
| 20° | | | | 0.39 | 0.39 | 0.39 | 0.41 | 0.44 | 0.49 | 0.56 | 0.65 | 0.73 | 0.81 | 0.87 | 0.91 | 0.94 | 0.96 | 0.97 | | | |
| 10° | | | | 0.54 | 0.53 | 0.53 | 0.54 | 0.57 | 0.62 | 0.70 | 0.79 | 0.88 | 0.97 | 1.03 | 1.08 | 1.11 | 1.13 | 1.14 | | | |
| 0° | | | | 0.70 | 0.70 | 0.69 | 0.70 | 0.73 | 0.78 | 0.85 | 0.94 | 1.03 | 1.12 | 1.19 | 1.24 | 1.28 | 1.30 | 1.31 | | | |
| L. = 760° $\phi$ = 40° | | | 0.15 | 0.15 | 0.16 | 0.18 | 0.21 | 0.25 | 0.30 | 0.36 | 0.42 | 0.48 | 0.54 | 0.57 | 0.60 | 0.62 | 0.62 | 0.62 | | | |
| 30° | | | 0.26 | 0.26 | 0.26 | 0.28 | 0.31 | 0.35 | 0.41 | 0.48 | 0.56 | 0.63 | 0.69 | 0.73 | 0.76 | 0.78 | 0.79 | 0.79 | | | |
| 20° | | | | 0.39 | 0.39 | 0.41 | 0.44 | 0.48 | 0.54 | 0.62 | 0.70 | 0.79 | 0.86 | 0.90 | 0.94 | 0.96 | 0.97 | 0.97 | | | |
| 10° | | | | 0.53 | 0.53 | 0.54 | 0.57 | 0.61 | 0.68 | 0.76 | 0.85 | 0.94 | 1.02 | 1.07 | 1.11 | 1.13 | 1.14 | 1.14 | | | |
| 0° | | | | 0.69 | 0.69 | 0.70 | 0.72 | 0.76 | 0.82 | 0.91 | 1.00 | 1.09 | 1.18 | 1.23 | 1.27 | 1.29 | 1.31 | 1.31 | | | |

# TABLE C.

| $\gamma' + \gamma''$ | Magnitude of greatest phase in Digits | $\gamma' + \gamma''$ | Magnitude of greatest phase in Digits. | $\gamma' + \gamma''$ | Magnitude of greatest phase in Digits | $\gamma' + \gamma''$ | Magnitude of greatest phase in Digits | $\gamma' + \gamma''$ | Magnitude of greatest phase in Digits | $\gamma' + \gamma''$. | Magnitude of greatest phase in Digits |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 35.47 | 0 | 45.46 | 0 | 55.45 | 0 | 65.44 | 0 | 75.43 | 0 | 85.42 | 0 |
| 35.51 | 1 | 45.50 | 1 | 55.50 | 1 | 65.49 | 1 | 75.48 | 1 | 85.47 | 1 |
| 35.56 | 2 | 45.55 | 2 | 55.54 | 2 | 65.54 | 2 | 75.53 | 2 | 85.52 | 2 |
| 35.60 | 3 | 45.59 | 3 | 55.59 | 3 | 65.58 | 3 | 75.58 | 3 | 85.57 | 3 |
| 35.64 | 4 | 45.64 | 4 | 55.63 | 4 | 65.63 | 4 | 75.63 | 4 | 85.62 | 4 |
| 35.68 | 5 | 45.68 | 5 | 55.68 | 5 | 65.68 | 5 | 75.68 | 5 | 85.66 | 5 |
| 35.73 | 6 Northern line. | 45.73 | 6 Northern line. | 55.73 | 6 Northern line. | 65.73 | 6 Northern line | 75.73 | 6 Northern line. | 85.73 | 6 Northern line |
| 35.77 | 7 | 45.77 | 7 | 55.77 | 7 | 65.77 | 7 | 75.78 | 7 | 85.78 | 7 |
| 35.81 | 8 | 45.82 | 8 | 55.82 | 8 | 65.82 | 8 | 75.83 | 8 | 85.83 | 8 |
| 35.85 | 9 | 45.86 | 9 | 55.86 | 9 | 65.87 | 9 | 75.87 | 9 | 85.88 | 9 |
| 35.90 | 10 | 45.90 | 10 | 55.91 | 10 | 65.92 | 10 | 75.92 | 10 | 85.93 | 10 |
| 35.94 | 11 | 45.95 | 11 | 55.96 | 11 | 65.97 | 11 | 75.97 | 11 | 85.98 | 11 |
| 35.98 | 12 | 45.99 | 12 | 56.00 | 12 | — | — | — | — | — | — |
| 36.00 | Total | 46.00 | Total | 56.00 | Total | 66.00 | Annular | 76.00 | Annular | 86.00 | Annular |
| 36.02 | 12 | 46.01 | 12 | 56.00 | 12 | — | — | — | — | — | — |
| 36.06 | 11 | 46.05 | 11 | 56.04 | 11 | 66.03 | 11 | 76.03 | 11 | 86.02 | 11 |
| 36.10 | 10 | 46.10 | 10 | 56.09 | 10 | 66.08 | 10 | 76.08 | 10 | 86.07 | 10 |
| 36.15 | 9 | 46.14 | 9 | 56.14 | 9 | 66.13 | 9 | 76.13 | 9 | 86.12 | 9 |
| 36.19 | 8 | 46.18 | 8 | 56.18 | 8 | 66.18 | 8 | 76.17 | 8 | 86.17 | 8 |
| 36.23 | 7 | 46.23 | 7 | 56.23 | 7 | 66.23 | 7 | 76.22 | 7 | 86.22 | 7 |
| 36.27 | 6 Southern line. | 46.27 | 6 Southern line. | 56.27 | 6 Southern line. | 66.27 | 6 Southern line. | 76.27 | 6 Southern line | 86.27 | 6 Southern line |
| 36.32 | 5 | 46.32 | 5 | 56.32 | 5 | 66.32 | 5 | 76.32 | 5 | 86.32 | 5 |
| 36.36 | 4 | 46.36 | 4 | 56.37 | 4 | 66.37 | 4 | 76.37 | 4 | 86.38 | 4 |
| 36.40 | 3 | 46.41 | 3 | 56.41 | 3 | 66.42 | 3 | 76.42 | 3 | 86.43 | 3 |
| 36.44 | 2 | 46.45 | 2 | 56.46 | 2 | 66.46 | 2 | 76.47 | 2 | 86.48 | 2 |
| 36.49 | 1 | 46.50 | 1 | 56.50 | 1 | 66.51 | 1 | 76.52 | 1 | 86.53 | 1 |
| 36.53 | 0 | 46.54 | 0 | 56.55 | 0 | 66.56 | 0 | 76.57 | 0 | 86.58 | 0 |

# TABLE D.

| λ + μ | 260° | 270° | 280° | 290° | 300° | 310° | 320° | 330° | 340° | 350° | 0° | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° | 100° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L = 0° φ = 40° | | 58.3 | 0.0 | 1.7 | 3.5 | 5.5 | 7.7 | 9.8 | 12.2 | 14.7 | 17.2 | 19.5 | 21.8 | 23.8 | 25.8 | 27.8 | 29.5 | 31.2 | | | |
| 30° | | | 59.3 | 1.0 | 2.8 | 4.7 | 6.8 | 9.2 | 11.5 | 14.2 | 16.8 | 19.3 | 21.7 | 23.8 | 26.0 | 27.8 | 29.7 | 31.3 | | | |
| 20° | | | 58.7 | 0.3 | 2.2 | 4.0 | 6.0 | 8.3 | 10.8 | 13.5 | 16.3 | 19.0 | 21.5 | 23.8 | 25.8 | 27.7 | 29.5 | 31.2 | | | |
| 10° | | | | 59.8 | 1.5 | 3.3 | 5.2 | 7.7 | 10.2 | 12.8 | 15.7 | 18.5 | 21.0 | 23.5 | 25.7 | 27.5 | 29.3 | 31.0 | | | |
| 0° | | | | 59.3 | 1.0 | 2.8 | 4.8 | 7.0 | 9.5 | 12.2 | 15.0 | 17.8 | 20.5 | 23.0 | 25.2 | 27.2 | 29.0 | 30.7 | | | |
| L = 10° φ = 40° | | 59.0 | 0.5 | 2.2 | 4.0 | 6.0 | 8.0 | 10.2 | 12.5 | 15.0 | 17.3 | 19.8 | 22.2 | 24.3 | 26.3 | 28.2 | 30.0 | 31.7 | | | |
| 30° | | | 59.7 | 1.3 | 3.0 | 5.0 | 7.0 | 9.3 | 11.7 | 14.3 | 16.8 | 19.3 | 21.8 | 24.2 | 26.2 | 28.2 | 29.8 | 31.5 | | | |
| 20° | | | 59.0 | 0.7 | 2.3 | 4.3 | 6.3 | 8.5 | 11.0 | 13.7 | 16.3 | 19.0 | 21.7 | 24.0 | 26.0 | 28.0 | 29.8 | 31.5 | | | |
| 10° | | | 58.5 | 0.0 | 1.7 | 3.5 | 5.5 | 7.7 | 10.0 | 12.7 | 15.5 | 18.3 | 21.0 | 23.5 | 25.7 | 27.7 | 29.5 | 31.2 | | | |
| 0° | | | | 59.3 | 1.0 | 2.8 | 4.7 | 6.8 | 9.3 | 11.8 | 14.7 | 17.5 | 20.3 | 22.8 | 25.0 | 27.2 | 29.0 | 30.7 | | | |
| L = 20° φ = 40° | | 59.8 | 0.8 | 2.5 | 4.3 | 6.3 | 8.3 | 10.5 | 12.8 | 15.2 | 17.7 | 20.2 | 22.5 | 24.7 | 26.7 | 28.7 | 30.5 | 32.2 | 33.8 | | |
| 30° | | 58.5 | 0.0 | 1.7 | 3.5 | 5.3 | 7.3 | 9.7 | 12.0 | 14.5 | 17.2 | 19.7 | 22.2 | 24.5 | 26.7 | 28.7 | 30.3 | 32.2 | | | |
| 20° | | | 59.2 | 0.7 | 2.5 | 4.3 | 6.3 | 8.5 | 10.8 | 13.5 | 16.3 | 19.0 | 21.7 | 24.0 | 26.2 | 28.2 | 30.0 | 31.7 | | | |
| 10° | | | | 59.8 | 1.5 | 3.3 | 5.3 | 7.5 | 9.8 | 12.5 | 15.3 | 18.2 | 20.8 | 23.3 | 25.7 | 27.7 | 29.5 | 31.2 | | | |
| 0° | | | | 59.3 | 1.0 | 2.7 | 4.7 | 6.7 | 9.0 | 11.7 | 14.5 | 17.3 | 20.2 | 22.7 | 25.0 | 27.2 | 29.0 | 30.7 | | | |
| L = 30° φ = 40° | | 59.8 | 1.5 | 3.2 | 4.8 | 6.7 | 8.7 | 10.8 | 13.2 | 15.7 | 18.2 | 20.5 | 23.0 | 25.2 | 27.3 | 29.3 | 31.0 | 32.7 | 34.3 | | |
| 30° | | 58.8 | 0.3 | 2.0 | 3.7 | 5.5 | 7.5 | 9.7 | 12.0 | 14.5 | 17.2 | 19.8 | 22.3 | 24.7 | 26.8 | 28.8 | 30.7 | 32.3 | 34.0 | | |
| 20° | | | 59.8 | 0.5 | 2.5 | 4.3 | 6.3 | 8.5 | 10.8 | 13.3 | 16.2 | 19.0 | 21.7 | 24.2 | 26.3 | 28.3 | 30.2 | 31.8 | | | |
| 10° | | | 58.5 | 0.0 | 1.7 | 3.5 | 5.3 | 7.5 | 9.8 | 12.3 | 15.2 | 18.2 | 20.8 | 23.5 | 25.8 | 27.8 | 29.7 | 31.3 | | | |
| 0° | | | | 59.3 | 1.0 | 2.7 | 4.5 | 6.5 | 8.8 | 11.5 | 14.2 | 17.2 | 20.0 | 22.7 | 25.0 | 27.2 | 29.0 | 30.7 | | | |
| L = 40° φ = 40° | 58.8 | 0.3 | 1.8 | 3.5 | 5.2 | 7.0 | 9.0 | 11.2 | 13.5 | 15.8 | 18.3 | 20.8 | 23.3 | 25.5 | 27.7 | 29.7 | 31.5 | 33.2 | 34.8 | | |
| 30° | | 59.0 | 0.5 | 2.2 | 3.8 | 5.7 | 7.5 | 9.7 | 12.0 | 14.7 | 17.3 | 20.0 | 22.5 | 25.0 | 27.2 | 29.2 | 31.0 | 32.7 | 34.5 | | |
| 20° | | | 59.5 | 1.0 | 2.7 | 4.5 | 6.3 | 8.5 | 10.8 | 13.5 | 16.3 | 19.2 | 21.8 | 24.3 | 26.7 | 28.7 | 30.5 | 32.2 | | | |
| 10° | | | 58.3 | 59.8 | 1.5 | 3.2 | 5.2 | 7.2 | 9.7 | 12.2 | 15.0 | 18.0 | 20.8 | 23.5 | 25.8 | 27.8 | 29.7 | 31.5 | | | |
| 0° | | | | 59.2 | 0.8 | 2.5 | 4.3 | 6.3 | 8.7 | 11.3 | 14.0 | 17.2 | 20.0 | 22.7 | 25.2 | 27.2 | 29.2 | 30.8 | | | |
| L = 50° φ = 40° | 59.2 | 0.5 | 2.2 | 3.7 | 5.5 | 7.3 | 9.2 | 11.3 | 13.7 | 16.2 | 18.7 | 21.2 | 23.7 | 26.0 | 28.0 | 30.0 | 32.0 | 33.7 | 35.3 | 36.8 | |
| 30° | | 59.2 | 0.7 | 2.2 | 3.8 | 5.7 | 7.7 | 9.8 | 12.2 | 14.7 | 17.3 | 20.2 | 22.7 | 25.2 | 27.3 | 29.5 | 31.3 | 33.0 | 34.7 | | |
| 20° | | | 59.5 | 1.0 | 2.7 | 4.5 | 6.3 | 8.5 | 10.8 | 13.5 | 16.3 | 19.2 | 22.0 | 24.5 | 26.8 | 28.8 | 30.7 | 32.5 | | | |
| 10° | | | 58.5 | 0.0 | 1.8 | 3.3 | 5.2 | 7.2 | 9.5 | 12.2 | 15.0 | 18.0 | 21.0 | 23.7 | 25.8 | 28.0 | 30.0 | 31.7 | | | |
| 0° | | | | 59.2 | 0.7 | 2.3 | 4.3 | 6.3 | 8.7 | 11.2 | 14.0 | 17.0 | 20.0 | 22.5 | 25.2 | 27.3 | 29.2 | 31.0 | | | |
| L = 60° φ = 40° | 59.2 | 0.7 | 2.2 | 3.8 | 5.5 | 7.3 | 9.3 | 11.5 | 13.7 | 16.2 | 18.7 | 21.3 | 23.8 | 26.2 | 28.3 | 30.3 | 32.2 | 33.8 | 35.5 | 37.0 | |
| 30° | | 59.2 | 0.7 | 2.2 | 3.8 | 5.7 | 7.7 | 9.7 | 12.2 | 14.7 | 17.3 | 20.2 | 22.8 | 25.3 | 27.5 | 29.5 | 31.5 | 33.2 | 34.8 | | |
| 20° | | | 59.5 | 1.0 | 2.7 | 4.5 | 6.3 | 8.5 | 10.8 | 13.5 | 16.3 | 19.3 | 22.0 | 24.7 | 27.0 | 28.8 | 30.8 | 32.5 | 34.2 | | |
| 10° | | | 58.2 | 59.8 | 1.8 | 3.2 | 5.0 | 7.2 | 9.5 | 12.2 | 15.0 | 18.0 | 21.0 | 23.7 | 26.0 | 28.2 | 30.0 | 31.7 | | | |
| 0° | | | | 59.0 | 0.7 | 2.3 | 4.2 | 6.2 | 8.5 | 11.2 | 14.2 | 17.2 | 20.2 | 22.8 | 25.3 | 27.3 | 29.3 | 31.0 | | | |
| L = 70° φ = 40° | 59.3 | 0.7 | 2.2 | 3.8 | 5.7 | 7.5 | 9.3 | 11.5 | 13.8 | 16.3 | 18.8 | 21.5 | 24.0 | 26.3 | 28.5 | 30.5 | 32.3 | 34.2 | 35.7 | 37.3 | |
| 30° | | 59.3 | 0.8 | 2.3 | 4.0 | 5.8 | 7.7 | 9.8 | 12.2 | 14.7 | 17.7 | 20.3 | 23.0 | 25.5 | 27.8 | 29.8 | 31.7 | 33.3 | 35.0 | | |
| 20° | | | 59.5 | 1.0 | 2.7 | 4.3 | 6.3 | 8.5 | 10.8 | 13.5 | 16.5 | 19.3 | 22.2 | 24.8 | 27.2 | 29.2 | 31.0 | 32.7 | 34.3 | | |
| 10° | | | | 59.8 | 1.5 | 3.2 | 5.2 | 7.2 | 9.5 | 12.3 | 15.2 | 18.3 | 21.3 | 23.8 | 26.2 | 28.3 | 30.2 | 31.8 | | | |
| 0° | | | | 59.0 | 0.5 | 2.2 | 4.2 | 6.2 | 8.7 | 11.2 | 14.2 | 17.3 | 20.5 | 23.2 | 25.5 | 27.5 | 29.3 | 31.2 | | | |

# TABLE D.

| λ − μ. | 260° | 270° | 280° | 290° | 300° | 310° | 320° | 330° | 340° | 350° | 0° | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° | 100° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L. = 80° φ = 40° | 59.3 | 0.7 | 2.2 | 3.8 | 5.5 | 7.3 | 9.3 | 11.5 | 13.8 | 16.3 | 19.0 | 21.5 | 24.0 | 26.3 | 28.5 | 30.5 | 32.3 | 34.2 | 35.7 | 37.3 | |
| 30° | | 59.2 | 0.5 | 2.2 | 3.5 | 5.5 | 7.5 | 9.7 | 12.0 | 14.7 | 17.5 | 20.3 | 23.0 | 25.5 | 27.7 | 29.7 | 31.5 | 33.3 | 34.8 | | |
| 20° | | | 59.3 | 0.8 | 2.5 | 4.3 | 6.3 | 8.3 | 10.7 | 13.5 | 16.3 | 19.3 | 22.2 | 24.8 | 27.0 | 29.2 | 31.0 | 32.7 | 34.2 | | |
| 10° | | | | 59.7 | 1.8 | 3.0 | 5.0 | 7.2 | 9.5 | 12.3 | 15.3 | 18.5 | 21.3 | 24.0 | 26.3 | 28.3 | 30.2 | 32.0 | | | |
| 0° | | | | 58.8 | 0.5 | 2.2 | 4.2 | 6.2 | 8.5 | 11.3 | 14.3 | 17.5 | 20.5 | 23.2 | 25.5 | 27.7 | 29.5 | 31.2 | | | |
| L. = 90° φ = 40° | 59.2 | 0.7 | 2.2 | 3.8 | 5.5 | 7.3 | 9.3 | 11.5 | 13.8 | 16.3 | 18.8 | 21.5 | 24.0 | 26.3 | 28.5 | 30.5 | 32.3 | 34.2 | 35.7 | 37.2 | 38.7 |
| 30° | | 59.0 | 0.5 | 2.2 | 3.8 | 5.5 | 7.5 | 9.7 | 12.2 | 14.8 | 17.5 | 20.3 | 23.2 | 25.5 | 27.8 | 29.8 | 31.7 | 33.3 | 34.5 | 36.3 | |
| 20° | | | 59.3 | 0.7 | 2.3 | 4.2 | 6.0 | 8.2 | 10.7 | 13.5 | 16.5 | 19.5 | 22.2 | 24.8 | 27.0 | 29.2 | 30.8 | 32.7 | 34.2 | | |
| 10° | | | | 59.7 | 1.2 | 3.0 | 5.0 | 7.2 | 9.7 | 12.3 | 15.5 | 18.7 | 21.5 | 24.2 | 26.3 | 28.3 | 30.2 | 31.8 | | | |
| 0° | | | | 58.8 | 0.5 | 2.2 | 4.2 | 6.5 | 8.7 | 11.5 | 14.7 | 17.5 | 20.8 | 23.5 | 25.7 | 27.7 | 29.5 | 31.2 | | | |
| L. = 100° φ = 40° | 58.8 | 0.3 | 1.8 | 3.3 | 5.2 | 7.0 | 8.8 | 11.0 | 13.3 | 16.0 | 18.5 | 21.2 | 23.7 | 26.0 | 28.2 | 30.2 | 32.0 | 33.8 | 35.3 | 36.8 | 38.3 |
| 30° | | 58.7 | 0.2 | 1.7 | 3.5 | 5.2 | 7.2 | 9.5 | 11.8 | 14.5 | 17.3 | 20.2 | 22.8 | 25.3 | 27.5 | 29.5 | 31.3 | 33.0 | 34.7 | 36.0 | |
| 20° | | | 59.0 | 0.5 | 2.2 | 4.0 | 6.0 | 8.2 | 10.8 | 13.5 | 16.5 | 19.5 | 22.3 | 24.7 | 27.0 | 29.0 | 30.8 | 32.5 | 34.0 | | |
| 10° | | | | 59.5 | 1.2 | 3.0 | 5.0 | 7.2 | 9.7 | 12.5 | 15.7 | 18.7 | 21.8 | 24.2 | 26.3 | 28.3 | 30.2 | 31.7 | | | |
| 0° | | | | 58.8 | 0.3 | 2.3 | 4.2 | 6.3 | 8.8 | 11.8 | 15.0 | 18.2 | 21.0 | 23.5 | 25.8 | 27.8 | 29.7 | 31.2 | | | |
| L. = 110° φ = 40° | | 59.8 | 1.3 | 3.0 | 4.7 | 6.5 | 8.5 | 10.7 | 13.2 | 15.7 | 18.3 | 20.8 | 23.3 | 25.7 | 27.8 | 29.8 | 31.7 | 33.3 | 35.0 | 36.5 | 38.0 |
| 30° | | 58.5 | 0.0 | 1.7 | 3.3 | 5.2 | 7.2 | 9.3 | 11.8 | 14.5 | 17.3 | 20.2 | 22.8 | 25.2 | 27.3 | 29.3 | 31.2 | 32.8 | 34.3 | 35.8 | |
| 20° | | | 59.0 | 0.5 | 2.2 | 4.0 | 6.0 | 8.2 | 10.8 | 13.5 | 16.5 | 19.5 | 22.2 | 24.7 | 27.0 | 29.0 | 30.7 | 32.3 | 33.8 | | |
| 10° | | | | 59.5 | 1.2 | 2.8 | 5.0 | 7.2 | 9.7 | 12.7 | 15.7 | 18.8 | 21.8 | 24.2 | 26.2 | 28.2 | 30.2 | 31.8 | | | |
| 0° | | | | 58.8 | 0.5 | 2.2 | 4.2 | 6.5 | 9.0 | 12.0 | 15.2 | 18.3 | 21.3 | 23.8 | 25.8 | 27.8 | 29.5 | 31.2 | | | |
| L. = 120° φ = 40° | | 59.8 | 0.8 | 2.5 | 4.2 | 6.0 | 8.0 | 10.2 | 12.5 | 15.0 | 17.7 | 20.3 | 22.8 | 25.2 | 27.3 | 29.3 | 31.2 | 32.8 | 34.5 | 36.0 | 37.3 |
| 30° | | | 59.5 | 1.2 | 2.8 | 4.7 | 6.7 | 8.8 | 11.3 | 14.0 | 16.8 | 19.7 | 22.3 | 24.7 | 26.8 | 28.8 | 30.7 | 32.3 | 34.0 | 35.3 | |
| 20° | | | 58.7 | 0.2 | 1.8 | 3.7 | 5.7 | 8.0 | 10.5 | 13.3 | 16.3 | 19.3 | 22.0 | 24.5 | 26.7 | 28.7 | 30.5 | 32.2 | 33.7 | | |
| 10° | | | | 59.3 | 1.0 | 2.8 | 4.8 | 7.0 | 9.7 | 12.8 | 15.7 | 18.8 | 21.5 | 24.0 | 26.2 | 28.2 | 29.9 | 31.5 | | | |
| 0° | | | | 58.8 | 0.5 | 2.3 | 4.3 | 6.7 | 9.2 | 12.2 | 15.3 | 18.5 | 21.3 | 23.7 | 25.8 | 27.8 | 29.5 | 31.2 | | | |
| L. = 130° φ = 40° | | 59.0 | 0.5 | 2.0 | 3.8 | 5.7 | 7.7 | 9.8 | 12.2 | 14.7 | 17.2 | 19.8 | 22.3 | 24.7 | 26.8 | 28.8 | 30.7 | 32.3 | 34.0 | 35.5 | |
| 30° | | | 59.3 | 0.8 | 2.5 | 4.3 | 6.3 | 8.7 | 11.0 | 13.7 | 16.5 | 19.3 | 22.0 | 24.3 | 26.5 | 28.5 | 30.3 | 32.0 | 33.7 | 35.0 | |
| 20° | | | 58.5 | 0.0 | 1.7 | 3.5 | 5.5 | 7.8 | 10.3 | 13.2 | 16.2 | 19.0 | 21.8 | 24.2 | 26.5 | 28.5 | 30.2 | 31.8 | 33.3 | | |
| 10° | | | | 59.3 | 1.0 | 2.8 | 4.8 | 7.2 | 9.7 | 12.7 | 15.7 | 18.7 | 21.5 | 24.0 | 26.2 | 28.0 | 29.8 | 31.5 | | | |
| 0° | | | | 58.8 | 0.5 | 2.3 | 4.3 | 6.8 | 9.3 | 12.3 | 15.5 | 18.5 | 21.3 | 23.7 | 25.8 | 27.5 | 29.6 | 31.2 | | | |
| L. = 140° φ = 40° | | | 59.8 | 1.5 | 3.2 | 5.0 | 7.0 | 9.2 | 11.5 | 13.8 | 16.5 | 19.0 | 21.5 | 24.0 | 26.0 | 28.0 | 30.0 | 31.7 | 33.3 | 34.8 | |
| 30° | | | 58.8 | 0.5 | 2.2 | 4.0 | 6.0 | 8.2 | 10.5 | 13.2 | 16.0 | 18.8 | 21.5 | 24.0 | 26.0 | 28.0 | 29.8 | 31.5 | 33.2 | | |
| 20° | | | | 59.8 | 1.5 | 3.3 | 5.3 | 7.5 | 10.0 | 12.8 | 15.8 | 18.8 | 21.5 | 24.0 | 26.2 | 28.2 | 29.8 | 31.5 | 33.0 | | |
| 10° | | | | 59.2 | 0.8 | 2.7 | 4.7 | 6.8 | 9.5 | 12.3 | 15.5 | 18.5 | 21.3 | 23.7 | 25.8 | 27.8 | 29.5 | 31.2 | | | |
| 0° | | | | 58.8 | 0.5 | 2.3 | 4.5 | 6.7 | 9.3 | 12.3 | 15.5 | 18.5 | 21.3 | 23.7 | 25.8 | 27.7 | 29.5 | 31.2 | | | |
| L. = 150° φ = 40° | | | 59.2 | 0.8 | 2.5 | 4.3 | 6.3 | 8.5 | 10.8 | 13.2 | 15.8 | 18.3 | 20.8 | 23.2 | 25.3 | 27.3 | 29.2 | 31.0 | 32.7 | 34.2 | |
| 30° | | | 58.5 | 0.2 | 1.8 | 3.5 | 5.6 | 7.7 | 10.2 | 12.8 | 15.5 | 18.3 | 21.0 | 23.3 | 25.5 | 27.5 | 29.3 | 31.2 | 32.7 | | |
| 20° | | | | 59.5 | 1.2 | 3.0 | 5.0 | 7.2 | 9.7 | 12.8 | 15.3 | 18.3 | 21.0 | 23.5 | 25.7 | 27.7 | 29.5 | 31.2 | 32.7 | | |
| 10° | | | | 59.2 | 0.8 | 2.7 | 4.7 | 6.8 | 9.5 | 12.3 | 15.3 | 18.3 | 21.2 | 23.7 | 25.8 | 27.7 | 29.5 | 31.2 | | | |
| 0° | | | | 58.8 | 0.7 | 2.5 | 4.5 | 6.8 | 9.5 | 12.3 | 15.3 | 18.5 | 21.2 | 23.7 | 25.8 | 27.7 | 29.3 | 31.2 | | | |

# TABLE D.

| λ + μ | 260° | 270° | 280° | 290° | 300° | 310° | 320° | 330° | 340° | 350° | 0° | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° | 100° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L = 160° δ = 40° | | | 58.3 | 0.2 | 1.8 | 3.7 | 5.7 | 7.7 | 10.0 | 12.5 | 15.2 | 17.7 | 20.0 | 22.3 | 24.5 | 26.5 | 28.5 | 30.2 | 31.8 | 33.3 | |
| 30° | | | | 59.7 | 1.3 | 3.2 | 5.2 | 7.3 | 9.7 | 12.3 | 15.0 | 17.8 | 20.3 | 22.8 | 25.0 | 27.0 | 29.0 | 30.7 | 32.2 | | |
| 20° | | | | 59.3 | 1.0 | 2.7 | 4.7 | 7.0 | 9.3 | 12.2 | 15.0 | 18.0 | 20.7 | 23.2 | 25.3 | 27.3 | 29.2 | 30.8 | 32.3 | | |
| 10° | | | | 59.0 | 0.7 | 2.5 | 4.5 | 6.7 | 9.2 | 12.0 | 15.0 | 18.0 | 20.8 | 23.3 | 25.5 | 27.5 | 29.3 | 31.0 | | | |
| 0° | | | | 59.0 | 0.7 | 2.5 | 4.5 | 6.8 | 9.3 | 12.2 | 15.3 | 18.3 | 21.0 | 23.5 | 25.7 | 27.7 | 29.3 | 31.0 | | | |
| L = 170° δ = 40° | | | | 59.7 | 1.3 | 3.2 | 5.0 | 7.0 | 9.8 | 11.7 | 14.3 | 16.8 | 19.3 | 21.7 | 24.0 | 26.0 | 27.8 | 29.7 | 31.3 | | |
| 30° | | | | 59.2 | 0.8 | 2.7 | 4.7 | 6.7 | 9.0 | 11.7 | 14.3 | 17.2 | 19.8 | 22.2 | 24.5 | 26.5 | 28.3 | 30.2 | 31.7 | | |
| 20° | | | | 59.2 | 0.8 | 2.5 | 4.5 | 6.7 | 9.2 | 11.8 | 14.7 | 17.5 | 20.3 | 22.8 | 25.2 | 27.2 | 29.0 | 30.7 | | | |
| 10° | | | | 59.0 | 0.7 | 2.5 | 4.3 | 6.7 | 9.2 | 11.8 | 14.8 | 17.8 | 20.7 | 23.2 | 25.5 | 27.5 | 29.2 | 30.8 | | | |
| 0° | | | | 59.0 | 0.7 | 2.5 | 4.5 | 6.8 | 9.3 | 12.2 | 15.2 | 18.2 | 21.0 | 23.5 | 25.7 | 27.7 | 29.3 | 31.0 | | | |
| L = 180° δ = 40° | | | | 59.2 | 0.8 | 2.5 | 4.5 | 6.5 | 8.7 | 11.2 | 13.7 | 16.2 | 18.7 | 21.2 | 23.3 | 25.3 | 27.3 | 29.2 | 30.8 | | |
| 30° | | | | 58.8 | 0.5 | 2.3 | 4.2 | 6.3 | 8.7 | 11.2 | 13.8 | 16.5 | 19.3 | 21.8 | 24.0 | 26.0 | 28.0 | 29.8 | 31.3 | | |
| 20° | | | | 58.8 | 0.5 | 2.2 | 4.2 | 6.3 | 8.7 | 11.3 | 14.2 | 17.0 | 19.8 | 22.5 | 24.7 | 26.7 | 28.5 | 30.3 | | | |
| 10° | | | | 58.8 | 0.5 | 2.2 | 4.2 | 6.3 | 8.8 | 11.7 | 14.5 | 17.3 | 20.3 | 23.0 | 25.2 | 27.2 | 29.0 | 30.7 | | | |
| 0° | | | | 59.0 | 0.7 | 2.5 | 4.5 | 6.7 | 9.2 | 12.0 | 15.0 | 18.0 | 20.8 | 23.3 | 25.5 | 27.5 | 29.3 | 31.0 | | | |
| L = 190° δ = 40° | | | | 58.7 | 0.3 | 2.0 | 3.8 | 6.0 | 8.2 | 10.5 | 13.0 | 15.7 | 18.2 | 20.5 | 22.8 | 24.8 | 26.8 | 28.7 | 30.3 | | |
| 30° | | | | 58.5 | 0.2 | 2.0 | 3.8 | 6.0 | 8.2 | 10.7 | 13.3 | 16.2 | 18.8 | 21.3 | 23.7 | 25.8 | 27.7 | 29.5 | | | |
| 20° | | | | 58.5 | 0.2 | 1.8 | 3.8 | 5.8 | 8.2 | 10.8 | 13.7 | 16.7 | 19.3 | 22.0 | 24.3 | 26.3 | 28.3 | 30.0 | | | |
| 10° | | | | 58.7 | 0.3 | 2.0 | 4.0 | 6.2 | 8.5 | 11.3 | 14.2 | 17.2 | 20.0 | 22.7 | 25.0 | 27.0 | 28.8 | 30.5 | | | |
| 0° | | | | 59.0 | 0.7 | 2.3 | 4.3 | 6.5 | 9.0 | 11.8 | 14.8 | 17.8 | 20.7 | 23.2 | 25.5 | 27.5 | 29.3 | 31.0 | | | |
| L = 200° δ = 40° | | | | | 59.8 | 1.7 | 3.5 | 5.5 | 7.7 | 10.0 | 12.5 | 15.0 | 17.7 | 20.0 | 22.3 | 24.5 | 26.3 | 28.2 | | | |
| 30° | | | | | 59.7 | 1.5 | 3.3 | 5.3 | 7.7 | 10.2 | 12.8 | 15.7 | 18.3 | 20.8 | 23.2 | 25.3 | 27.2 | 29.0 | | | |
| 20° | | | | 58.3 | 0.0 | 1.7 | 3.5 | 5.7 | 8.0 | 10.7 | 13.5 | 16.3 | 19.2 | 21.8 | 24.2 | 26.2 | 28.0 | 29.5 | | | |
| 10° | | | | 58.7 | 0.3 | 2.0 | 4.0 | 6.0 | 8.5 | 11.2 | 14.2 | 17.2 | 20.0 | 22.7 | 25.0 | 27.0 | 28.8 | 30.7 | | | |
| 0° | | | | 59.0 | 0.7 | 2.3 | 4.3 | 6.5 | 9.0 | 11.7 | 14.7 | 17.8 | 20.7 | 23.2 | 25.5 | 27.5 | 29.3 | 31.0 | | | |
| L = 210° δ = 40° | | | | | 59.2 | 1.0 | 2.8 | 4.8 | 7.0 | 9.8 | 11.8 | 14.5 | 17.0 | 19.5 | 21.8 | 23.8 | 25.8 | 27.7 | | | |
| 30° | | | | | 59.3 | 1.2 | 3.0 | 5.0 | 7.3 | 9.8 | 12.5 | 15.3 | 18.0 | 20.7 | 23.0 | 25.0 | 27.0 | 28.8 | | | |
| 20° | | | | | 59.8 | 1.5 | 3.3 | 5.5 | 7.8 | 10.3 | 13.2 | 16.2 | 19.0 | 21.7 | 24.0 | 26.2 | 28.0 | 29.8 | | | |
| 10° | | | | 58.5 | 0.2 | 1.8 | 3.7 | 5.8 | 8.2 | 10.8 | 13.8 | 17.0 | 19.8 | 22.5 | 24.8 | 27.0 | 28.8 | 30.5 | | | |
| 0° | | | | 58.8 | 0.5 | 2.3 | 4.2 | 6.3 | 8.8 | 11.5 | 14.7 | 17.7 | 20.5 | 23.2 | 25.5 | 27.5 | 29.3 | 31.2 | | | |
| L = 220° δ = 40° | | | | | 58.8 | 0.5 | 2.3 | 4.3 | 6.7 | 9.0 | 11.5 | 14.2 | 16.7 | 19.2 | 21.5 | 23.5 | 25.5 | 27.8 | | | |
| 30° | | | | | 59.2 | 0.8 | 2.7 | 4.8 | 7.2 | 9.7 | 12.3 | 15.2 | 17.8 | 20.5 | 22.8 | 24.8 | 26.8 | 28.5 | | | |
| 20° | | | | | 59.5 | 1.2 | 3.0 | 5.2 | 7.5 | 10.2 | 13.0 | 16.0 | 18.8 | 21.5 | 23.8 | 26.0 | 27.8 | 29.5 | | | |
| 10° | | | | | 0.0 | 1.8 | 3.7 | 5.8 | 8.2 | 11.0 | 13.8 | 17.0 | 20.0 | 22.7 | 25.0 | 27.0 | 28.8 | 30.5 | | | |
| 0° | | | | 0.5 | 2.2 | 4.0 | 5.8 | 8.0 | 10.0 | 13.2 | 16.2 | 19.0 | 22.3 | 25.0 | 27.3 | 29.3 | 31.2 | 32.8 | | | |
| L = 230° δ = 40° | | | | | 58.3 | 0.2 | 2.0 | 4.2 | 6.3 | 8.7 | 11.3 | 13.8 | 16.5 | 18.8 | 21.2 | 23.3 | 25.2 | | | | |
| 30° | | | | | 58.8 | 0.7 | 2.5 | 4.7 | 6.8 | 9.5 | 12.2 | 15.0 | 17.7 | 20.3 | 22.7 | 24.7 | 26.7 | | | | |
| 20° | | | | | 59.8 | 1.0 | 3.0 | 5.0 | 7.5 | 10.0 | 13.0 | 16.0 | 18.8 | 21.5 | 23.8 | 25.8 | 27.8 | | | | |
| 10° | | | | | 59.8 | 1.7 | 3.5 | 5.7 | 8.0 | 10.8 | 13.8 | 17.0 | 19.8 | 22.5 | 24.8 | 26.8 | 28.8 | 30.5 | | | |
| 0° | | | | 58.8 | 0.5 | 2.2 | 4.2 | 6.3 | 8.7 | 11.5 | 14.5 | 17.7 | 20.7 | 23.2 | 25.7 | 27.7 | 29.5 | 31.2 | | | |

# TABLE D.

| λ − μ | 260° | 270° | 280° | 290° | 300° | 310° | 320° | 330° | 340° | 350° | 0° | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° | 100° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L. = 240° φ = 40° | | | | | 58.2 | 0.0 | 1.8 | 4.0 | 6.2 | 8.7 | 11.3 | 13.8 | 16.5 | 18.8 | 21.2 | 23.2 | 25.0 | | | | |
| 30° | | | | | 58.8 | 0.5 | 2.5 | 4.7 | 7.0 | 9.5 | 12.3 | 15.2 | 17.8 | 20.3 | 22.7 | 24.8 | 26.7 | | | | |
| 20° | | | | | 59.2 | 1.0 | 2.8 | 5.0 | 7.5 | 10.2 | 13.0 | 16.0 | 19.0 | 21.5 | 23.8 | 25.8 | 27.7 | | | | |
| 10° | | | | | 0.0 | 1.6 | 3.7 | 5.7 | 8.2 | 11.0 | 14.0 | 17.3 | 20.2 | 22.7 | 25.0 | 27.0 | 28.8 | 30.5 | | | |
| 0° | | | | 58.8 | 0.5 | 2.2 | 4.2 | 6.3 | 8.7 | 11.5 | 14.7 | 17.8 | 20.6 | 23.8 | 25.7 | 27.7 | 29.5 | 31.2 | | | |
| L. = 250° φ = 40° | | | | | | 59.8 | 1.8 | 4.0 | 6.3 | 8.8 | 11.3 | 14.0 | 16.5 | 18.8 | 21.2 | 23.2 | 25.0 | | | | |
| 30° | | | | | 58.7 | 0.3 | 2.3 | 4.5 | 7.0 | 9.5 | 12.3 | 15.2 | 17.8 | 20.3 | 22.7 | 24.7 | 26.5 | | | | |
| 20° | | | | | 59.2 | 0.8 | 2.8 | 5.0 | 7.5 | 10.2 | 13.2 | 16.3 | 19.0 | 21.5 | 23.8 | 25.8 | 27.7 | | | | |
| 10° | | | | | 59.8 | 1.5 | 3.5 | 5.7 | 8.2 | 11.0 | 14.2 | 17.3 | 20.2 | 22.7 | 25.0 | 27.0 | 28.8 | | | | |
| 0° | | | | 58.8 | 0.5 | 2.2 | 4.2 | 6.3 | 8.5 | 11.7 | 14.8 | 18.0 | 21.0 | 23.5 | 25.8 | 27.8 | 29.5 | 31.2 | | | |
| L. = 260° φ = 40° | | | | | 58.2 | 0.0 | 2.0 | 4.2 | 6.5 | 9.0 | 11.7 | 14.3 | 16.8 | 19.2 | 21.2 | 23.2 | | | | | |
| 30° | | | | | 58.8 | 0.7 | 2.7 | 4.8 | 7.3 | 10.0 | 12.8 | 15.7 | 18.3 | 20.7 | 22.8 | 24.8 | 26.7 | | | | |
| 20° | | | | | 59.2 | 1.0 | 3.0 | 5.3 | 7.8 | 10.7 | 13.7 | 16.7 | 19.3 | 21.8 | 24.0 | 26.0 | 27.8 | | | | |
| 10° | | | | | 59.8 | 1.7 | 3.7 | 5.8 | 8.5 | 11.3 | 14.5 | 17.5 | 20.3 | 22.5 | 25.2 | 27.2 | 28.8 | | | | |
| 0° | | | | 58.8 | 0.5 | 2.2 | 4.2 | 6.5 | 9.0 | 11.8 | 15.0 | 18.2 | 21.2 | 23.7 | 25.8 | 27.8 | 29.7 | 31.2 | | | |
| L. = 270° φ = 40° | | | | | 58.2 | 0.0 | 2.2 | 4.3 | 6.7 | 9.3 | 12.0 | 14.5 | 17.0 | 19.3 | 21.3 | 23.3 | | | | | |
| 30° | | | | | 58.8 | 0.7 | 2.8 | 5.0 | 7.5 | 10.3 | 13.2 | 15.8 | 18.5 | 20.8 | 23.0 | 24.8 | 26.7 | | | | |
| 20° | | | | | 59.3 | 1.2 | 3.3 | 5.7 | 8.2 | 11.0 | 14.0 | 17.0 | 19.7 | 22.0 | 24.3 | 26.2 | 28.0 | | | | |
| 10° | | | | 58.2 | 0.0 | 1.8 | 3.8 | 6.0 | 8.7 | 11.7 | 14.8 | 17.8 | 20.7 | 23.0 | 25.2 | 27.2 | 28.8 | | | | |
| 0° | | | | 58.8 | 0.5 | 2.3 | 4.3 | 6.5 | 9.2 | 12.2 | 15.3 | 18.5 | 21.3 | 23.7 | 25.8 | 27.8 | 29.5 | 31.2 | | | |
| L. = 280° φ = 40° | | | | | 58.7 | 0.7 | 2.7 | 5.0 | 7.5 | 10.0 | 12.7 | 15.2 | 17.5 | 19.8 | 21.8 | 23.7 | | | | | |
| 30° | | | | | 59.2 | 1.2 | 3.3 | 5.7 | 8.2 | 11.0 | 13.8 | 16.5 | 19.0 | 21.3 | 23.3 | 25.2 | 27.0 | | | | |
| 20° | | | | | 59.5 | 1.5 | 3.5 | 6.0 | 8.5 | 11.5 | 14.5 | 17.3 | 20.0 | 22.3 | 24.3 | 26.3 | 28.0 | | | | |
| 10° | | | | 58.3 | 0.0 | 2.0 | 4.0 | 6.3 | 9.0 | 12.0 | 15.2 | 18.2 | 20.8 | 23.2 | 25.3 | 27.2 | 29.0 | | | | |
| 0° | | | | 58.8 | 0.5 | 2.3 | 4.5 | 6.8 | 9.5 | 12.5 | 15.7 | 18.7 | 21.5 | 23.8 | 25.8 | 27.8 | 29.5 | 31.2 | | | |
| L. = 290° φ = 40° | | | | | 59.3 | 1.3 | 3.3 | 5.5 | 8.0 | 10.8 | 13.3 | 15.8 | 18.0 | 20.3 | 22.3 | 24.0 | | | | | |
| 30° | | | | | 59.5 | 1.5 | 3.7 | 6.0 | 8.7 | 11.3 | 14.2 | 16.8 | 19.3 | 21.5 | 23.5 | 25.3 | 27.0 | | | | |
| 20° | | | | | 59.7 | 1.7 | 3.8 | 6.3 | 8.8 | 11.8 | 14.8 | 17.7 | 20.2 | 22.5 | 24.5 | 26.3 | 28.0 | | | | |
| 10° | | | | 58.5 | 0.2 | 2.2 | 4.2 | 6.7 | 9.3 | 12.3 | 15.5 | 18.3 | 21.0 | 23.3 | 25.3 | 27.2 | 28.8 | | | | |
| 0° | | | | 58.8 | 0.7 | 2.5 | 4.5 | 6.8 | 9.5 | 12.7 | 15.8 | 18.8 | 21.5 | 23.8 | 25.8 | 27.8 | 29.5 | 31.0 | | | |
| L. = 300° φ = 40° | | | | | 59.7 | 1.8 | 4.0 | 6.3 | 8.8 | 11.8 | 13.8 | 16.3 | 18.7 | 20.7 | 22.7 | 24.5 | | | | | |
| 30° | | | | 58.2 | 0.0 | 2.0 | 4.2 | 6.7 | 9.3 | 12.0 | 14.8 | 17.3 | 19.8 | 22.5 | 24.0 | 25.8 | 27.5 | | | | |
| 20° | | | | 58.3 | 0.2 | 2.2 | 4.3 | 6.7 | 9.5 | 12.8 | 15.2 | 18.0 | 20.5 | 22.7 | 24.7 | 26.5 | 28.2 | | | | |
| 10° | | | | 58.7 | 0.5 | 2.5 | 4.7 | 7.0 | 9.8 | 12.7 | 15.8 | 18.7 | 21.2 | 23.5 | 25.5 | 27.3 | 29.0 | | | | |
| 0° | | | | 59.0 | 0.7 | 2.7 | 4.7 | 7.2 | 9.5 | 12.8 | 15.8 | 18.8 | 21.5 | 23.8 | 25.8 | 27.7 | 29.3 | 31.0 | | | |
| L. = 310° φ = 40° | | | | 58.5 | 0.3 | 2.3 | 4.7 | 7.0 | 9.8 | 12.0 | 14.5 | 16.8 | 19.2 | 21.2 | 23.2 | 25.0 | | | | | |
| 30° | | | | 58.7 | 0.5 | 2.5 | 4.7 | 7.2 | 9.8 | 12.5 | 15.2 | 17.7 | 20.2 | 22.2 | 24.2 | 26.0 | 27.7 | | | | |
| 20° | | | | 58.7 | 0.5 | 2.5 | 4.8 | 7.2 | 9.8 | 12.7 | 15.7 | 18.3 | 20.7 | 23.0 | 25.0 | 26.7 | 28.3 | | | | |
| 10° | | | | 58.8 | 0.7 | 2.7 | 4.8 | 7.2 | 10.0 | 13.0 | 15.5 | 18.7 | 21.2 | 23.5 | 25.5 | 27.3 | 29.0 | 30.5 | | | |
| 0° | | | | 59.0 | 0.8 | 2.7 | 4.8 | 7.5 | 10.0 | 13.0 | 16.0 | 18.8 | 21.3 | 23.7 | 25.7 | 27.7 | 29.3 | 30.8 | | | |

# TABLE D.

| λ ÷ μ. | 260° | 270° | 280° | 290° | 300° | 310° | 320° | 330° | 340° | 350° | 0° | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° | 100° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L. = 320° φ = 40° | | | | 59.2 | 1.2 | 3.2 | 5.3 | 7.7 | 10.2 | 12.7 | 15.2 | 17.5 | 19.7 | 21.8 | 23.7 | 25.5 | 27.2 | | | | |
| 30° | | | | 59.2 | 1.0 | 3.0 | 5.3 | 7.7 | 10.3 | 13.0 | 15.7 | 18.2 | 20.5 | 22.5 | 24.5 | 26.3 | 28.0 | | | | |
| 20° | | | | 59.0 | 0.8 | 2.8 | 5.0 | 7.5 | 10.2 | 13.2 | 15.8 | 18.5 | 20.8 | 23.2 | 25.0 | 26.8 | 28.5 | | | | |
| 10° | | | | 59.2 | 1.0 | 2.8 | 5.0 | 7.5 | 10.2 | 13.2 | 16.0 | 18.8 | 21.3 | 23.7 | 25.7 | 27.5 | 29.2 | 30.7 | | | |
| 0° | | | | 59.2 | 0.8 | 2.8 | 4.8 | 7.3 | 10.0 | 12.8 | 16.0 | 18.7 | 21.3 | 23.7 | 25.7 | 27.5 | 29.2 | 30.8 | | | |
| L. = 330° φ = 40° | | | | 59.8 | 1.8 | 3.8 | 6.0 | 8.3 | 10.7 | 13.2 | 15.7 | 18.0 | 20.3 | 22.3 | 24.2 | 26.0 | 27.8 | | | | |
| 30° | | | | 59.7 | 1.5 | 3.5 | 5.7 | 8.2 | 10.7 | 13.3 | 16.0 | 18.5 | 20.8 | 23.0 | 24.8 | 26.7 | 28.3 | | | | |
| 20° | | | | 59.5 | 1.3 | 3.3 | 5.5 | 7.8 | 10.5 | 13.3 | 16.2 | 18.8 | 21.2 | 23.3 | 25.3 | 27.2 | 28.8 | | | | |
| 10° | | | | 59.3 | 1.0 | 3.0 | 5.2 | 7.5 | 10.2 | 13.0 | 16.0 | 18.7 | 21.2 | 23.5 | 25.5 | 27.3 | 29.0 | 30.7 | | | |
| 0° | | | | 59.3 | 1.0 | 2.8 | 5.0 | 7.3 | 10.0 | 12.8 | 15.8 | 18.5 | 21.2 | 23.5 | 25.5 | 27.3 | 29.0 | 30.7 | | | |
| L. = 340° φ = 40° | | | 59.0 | 0.7 | 2.5 | 4.5 | 6.7 | 9.0 | 11.5 | 13.8 | 16.3 | 18.7 | 21.0 | 23.0 | 25.0 | 26.8 | 28.5 | | | | |
| 30° | | | 58.8 | 0.2 | 2.0 | 4.0 | 6.2 | 8.5 | 11.0 | 13.7 | 16.2 | 18.7 | 21.2 | 23.2 | 25.2 | 27.0 | 28.7 | | | | |
| 20° | | | | 59.6 | 1.7 | 3.5 | 5.7 | 8.0 | 10.7 | 13.3 | 16.2 | 18.8 | 21.3 | 23.5 | 25.5 | 27.3 | 29.0 | 30.7 | | | |
| 10° | | | | 59.5 | 1.3 | 3.2 | 5.3 | 7.7 | 10.3 | 13.2 | 16.0 | 18.7 | 21.5 | 23.7 | 25.7 | 27.5 | 29.2 | 30.8 | | | |
| 0° | | | | 59.3 | 1.0 | 2.8 | 5.0 | 7.3 | 9.8 | 12.7 | 15.5 | 18.3 | 21.0 | 23.3 | 25.3 | 27.3 | 29.0 | 30.7 | | | |
| L. = 350° φ = 40° | | | 59.5 | 1.2 | 3.2 | 5.0 | 7.2 | 9.5 | 11.8 | 14.3 | 16.8 | 19.2 | 21.3 | 23.5 | 25.5 | 27.3 | 29.0 | 30.7 | | | |
| 30° | | | 59.0 | 0.7 | 2.5 | 4.5 | 6.7 | 8.8 | 11.3 | 14.0 | 16.7 | 19.2 | 21.5 | 23.7 | 25.7 | 27.5 | 29.2 | 30.8 | | | |
| 20° | | | 58.3 | 0.0 | 1.8 | 3.7 | 5.8 | 8.2 | 10.7 | 13.5 | 16.2 | 18.8 | 21.3 | 23.5 | 25.7 | 27.5 | 29.2 | 30.8 | | | |
| 10° | | | | 59.7 | 1.3 | 3.2 | 5.3 | 7.7 | 10.2 | 13.0 | 15.8 | 18.5 | 21.0 | 23.3 | 25.5 | 27.3 | 29.3 | 30.8 | | | |
| 0° | | | | 59.3 | 1.0 | 2.8 | 5.0 | 7.2 | 9.7 | 12.5 | 15.3 | 18.2 | 20.7 | 23.2 | 25.3 | 27.2 | 29.0 | 30.7 | | | |
| L. = 360° φ = 40° | | 58.3 | 0.0 | 1.7 | 3.5 | 5.5 | 7.7 | 9.8 | 12.2 | 14.7 | 17.2 | 19.5 | 21.8 | 23.8 | 25.8 | 27.8 | 29.5 | 31.2 | | | |
| 30° | | | 59.3 | 1.0 | 2.8 | 4.7 | 6.8 | 9.2 | 11.5 | 14.2 | 16.8 | 19.3 | 21.7 | 23.8 | 26.0 | 27.8 | 29.7 | 31.3 | | | |
| 20° | | | 58.7 | 0.3 | 2.2 | 4.0 | 6.0 | 8.3 | 10.8 | 13.5 | 16.3 | 19.0 | 21.5 | 23.8 | 25.8 | 27.7 | 29.5 | 31.2 | | | |
| 10° | | | | 59.5 | 1.5 | 3.3 | 5.3 | 7.7 | 10.2 | 12.8 | 15.7 | 18.5 | 21.0 | 23.5 | 25.7 | 27.5 | 29.3 | 31.0 | | | |
| 0° | | | | 59.3 | 1.0 | 2.8 | 4.8 | 7.0 | 9.5 | 12.2 | 15.0 | 17.8 | 20.5 | 23.0 | 25.2 | 27.2 | 29.0 | 30.7 | | | |
| L. = 400° φ = 40° | | | 59.2 | 0.8 | 2.7 | 4.7 | 6.7 | 8.8 | 11.3 | 13.8 | 16.3 | 18.8 | 21.3 | 23.5 | 25.5 | 27.5 | 29.2 | 30.8 | | | |
| 30° | | | 58.7 | 0.2 | 2.0 | 4.0 | 6.0 | 8.2 | 10.7 | 13.5 | 16.2 | 18.8 | 21.3 | 23.7 | 25.8 | 27.7 | 29.5 | 31.2 | | | |
| 20° | | | | 59.7 | 1.5 | 3.3 | 5.3 | 7.5 | 10.2 | 13.0 | 15.8 | 18.7 | 21.3 | 23.7 | 25.8 | 27.8 | 29.5 | 31.2 | | | |
| 10° | | | | 59.3 | 1.0 | 2.8 | 4.8 | 7.0 | 9.7 | 12.5 | 15.5 | 18.3 | 21.2 | 23.7 | 25.8 | 27.8 | 29.5 | 31.2 | | | |
| 0° | | | | 59.0 | 0.7 | 2.5 | 4.5 | 6.7 | 9.2 | 12.0 | 15.0 | 18.0 | 20.8 | 23.3 | 25.5 | 27.5 | 29.3 | 31.0 | | | |
| L. = 410° φ = 40° | | | 59.7 | 1.5 | 3.2 | 5.0 | 7.0 | 9.3 | 11.7 | 14.2 | 16.7 | 19.3 | 21.7 | 24.0 | 26.0 | 27.8 | 29.7 | 31.5 | | | |
| 30° | | | 59.5 | 0.5 | 2.3 | 4.2 | 6.2 | 8.5 | 10.8 | 13.5 | 16.3 | 19.0 | 21.7 | 24.0 | 26.0 | 28.0 | 29.8 | 31.5 | | | |
| 20° | | | | 0.0 | 1.7 | 3.5 | 5.5 | 7.8 | 10.3 | 13.2 | 16.0 | 18.8 | 21.5 | 24.0 | 26.2 | 28.2 | 29.8 | 31.5 | | | |
| 10° | | | | 59.5 | 1.2 | 2.8 | 4.8 | 7.2 | 9.7 | 12.5 | 15.5 | 18.5 | 21.2 | 23.7 | 26.0 | 27.8 | 29.7 | 31.3 | | | |
| 0° | | | | 59.0 | 0.7 | 2.3 | 4.3 | 6.5 | 9.0 | 11.8 | 14.8 | 17.8 | 20.7 | 23.2 | 25.5 | 27.5 | 29.3 | 31.0 | | | |
| L. = 420° φ = 40° | | 58.7 | 0.2 | 1.8 | 3.5 | 5.5 | 7.5 | 9.7 | 12.0 | 14.3 | 16.8 | 19.5 | 22.0 | 24.3 | 26.3 | 28.3 | 30.2 | 31.8 | 33.5 | | |
| 30° | | | 59.5 | 1.0 | 2.7 | 4.7 | 6.7 | 8.8 | 11.3 | 13.8 | 16.7 | 19.3 | 22.0 | 24.3 | 26.5 | 28.5 | 30.3 | 32.0 | | | |
| 20° | | | 58.7 | 0.2 | 1.8 | 3.7 | 5.7 | 7.8 | 10.3 | 13.0 | 16.0 | 18.8 | 21.7 | 24.0 | 26.3 | 28.3 | 30.0 | 31.7 | | | |
| 10° | | | | 59.3 | 1.0 | 2.8 | 4.8 | 7.0 | 9.5 | 12.3 | 15.3 | 18.3 | 21.2 | 23.7 | 25.8 | 27.8 | 29.7 | 31.3 | | | |
| 0° | | | | 59.0 | 0.7 | 2.3 | 4.3 | 6.5 | 9.0 | 11.7 | 14.7 | 17.8 | 20.7 | 23.2 | 25.5 | 27.5 | 29.3 | 31.0 | | | |

# TABLE D.

| λ + μ. | 260° | 270° | 280° | 290° | 300° | 310° | 320° | 330° | 340° | 350° | 0° | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° | 100° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L = 430° φ = 40° | | 59.2 | 0.7 | 2.3 | 4.2 | 6.0 | 8.0 | 10.2 | 12.5 | 15.0 | 17.5 | 20.2 | 22.5 | 24.8 | 27.0 | 29.0 | 30.8 | 32.5 | 34.2 | | |
| 30° | | | 59.7 | 1.2 | 3.0 | 4.8 | 6.8 | 9.0 | 11.3 | 14.0 | 16.8 | 19.5 | 22.2 | 24.7 | 26.8 | 28.8 | 30.5 | 32.2 | 33.8 | | |
| 20° | | | 58.7 | 0.2 | 1.8 | 3.7 | 5.7 | 7.8 | 10.3 | 13.0 | 16.0 | 18.8 | 21.7 | 24.2 | 26.3 | 28.3 | 30.2 | 31.8 | | | |
| 10° | | | | 59.5 | 1.2 | 3.0 | 4.8 | 7.0 | 9.5 | 12.3 | 15.3 | 18.3 | 21.2 | 23.8 | 26.0 | 28.0 | 29.8 | 31.5 | | | |
| 0° | | | | 58.8 | 0.5 | 2.3 | 4.2 | 6.3 | 8.8 | 11.5 | 14.7 | 17.7 | 20.5 | 23.2 | 25.5 | 27.5 | 29.3 | 31.2 | | | |
| L = 440° φ = 40° | | 59.5 | 1.0 | 2.7 | 4.3 | 6.3 | 8.3 | 10.3 | 12.8 | 15.3 | 17.8 | 20.5 | 22.8 | 25.2 | 27.3 | 29.3 | 31.2 | 32.8 | 34.5 | | |
| 30° | | | 59.6 | 1.5 | 3.2 | 5.0 | 7.0 | 9.0 | 11.5 | 14.2 | 17.0 | 19.8 | 22.5 | 24.8 | 27.0 | 29.0 | 30.9 | 32.5 | 34.2 | | |
| 20° | | | 59.0 | 0.5 | 2.2 | 3.8 | 5.8 | 8.0 | 10.5 | 13.2 | 16.2 | 19.2 | 22.0 | 24.5 | 26.7 | 28.7 | 30.5 | 32.2 | | | |
| 10° | | | | 59.5 | 1.2 | 2.8 | 4.8 | 7.0 | 9.8 | 12.2 | 15.2 | 18.3 | 21.2 | 23.8 | 26.0 | 28.0 | 29.8 | 31.5 | | | |
| 0° | | | | 58.8 | 0.5 | 2.3 | 4.2 | 6.3 | 8.7 | 11.5 | 14.5 | 17.7 | 20.7 | 23.3 | 25.5 | 27.7 | 29.5 | 31.2 | | | |
| L = 450° φ = 40° | | 59.8 | 1.3 | 3.0 | 4.7 | 6.5 | 8.5 | 10.7 | 13.0 | 15.5 | 18.2 | 20.7 | 23.2 | 25.5 | 27.7 | 29.7 | 31.5 | 33.3 | 34.8 | 36.5 | |
| 30° | | 58.7 | 0.0 | 1.7 | 3.3 | 5.2 | 7.2 | 9.3 | 11.7 | 14.3 | 17.2 | 20.0 | 22.7 | 25.0 | 27.3 | 29.3 | 31.2 | 32.8 | 34.3 | | |
| 20° | | | 59.0 | 0.5 | 2.2 | 4.0 | 5.8 | 8.2 | 10.5 | 13.3 | 16.2 | 19.2 | 22.0 | 24.5 | 26.5 | 28.8 | 30.7 | 32.3 | 33.9 | | |
| 10° | | | | 59.5 | 1.2 | 3.0 | 4.8 | 7.0 | 9.5 | 12.3 | 15.3 | 18.3 | 21.3 | 23.8 | 26.2 | 28.2 | 30.0 | 31.7 | | | |
| 0° | | | | 58.8 | 0.5 | 2.2 | 4.2 | 6.3 | 8.7 | 11.5 | 14.5 | 17.7 | 20.7 | 23.2 | 25.7 | 27.7 | 29.5 | 31.2 | | | |
| L = 460° φ = 40° | 58.7 | 0.0 | 1.5 | 3.2 | 4.8 | 6.7 | 8.7 | 10.8 | 13.2 | 15.7 | 18.3 | 21.0 | 23.5 | 25.8 | 28.0 | 30.0 | 31.8 | 33.5 | 35.2 | 36.7 | |
| 30° | | 58.7 | 0.0 | 1.7 | 3.3 | 5.2 | 7.2 | 9.8 | 11.7 | 14.8 | 17.2 | 20.0 | 22.7 | 25.2 | 27.3 | 29.8 | 31.2 | 32.8 | 34.5 | | |
| 20° | | | 59.0 | 0.5 | 2.2 | 4.0 | 6.0 | 8.2 | 10.7 | 13.3 | 16.3 | 19.3 | 22.2 | 24.7 | 27.0 | 29.0 | 30.8 | 32.5 | 34.0 | | |
| 10° | | | | 59.5 | 1.2 | 2.8 | 4.8 | 7.0 | 9.5 | 12.2 | 15.3 | 18.5 | 21.3 | 24.0 | 26.2 | 28.2 | 30.0 | 31.7 | | | |
| 0° | | | | 58.8 | 0.5 | 2.2 | 4.2 | 6.0 | 8.7 | 11.5 | 14.7 | 17.8 | 20.8 | 23.8 | 25.7 | 27.7 | 29.5 | 31.2 | | | |
| L = 470° φ = 40° | 58.7 | 0.2 | 1.7 | 3.3 | 5.0 | 6.8 | 8.8 | 11.0 | 13.3 | 15.8 | 18.3 | 21.0 | 23.5 | 26.0 | 28.2 | 30.2 | 32.0 | 33.7 | 35.3 | 36.8 | |
| 30° | | 58.9 | 0.3 | 1.8 | 3.5 | 5.3 | 7.3 | 9.5 | 11.8 | 14.5 | 17.3 | 20.2 | 22.8 | 25.3 | 27.5 | 29.5 | 31.3 | 33.0 | 34.7 | 36.3 | |
| 20° | | | 59.2 | 0.7 | 2.3 | 4.0 | 6.0 | 8.3 | 10.7 | 13.5 | 16.5 | 19.5 | 22.3 | 24.8 | 27.0 | 29.0 | 30.8 | 32.5 | 34.0 | | |
| 10° | | | | 59.5 | 1.2 | 3.0 | 5.0 | 7.2 | 9.7 | 12.5 | 15.7 | 18.7 | 21.7 | 24.2 | 26.3 | 28.5 | 30.2 | 31.8 | | | |
| 0° | | | | 58.8 | 0.5 | 2.2 | 4.2 | 6.3 | 8.8 | 11.7 | 14.8 | 18.0 | 21.0 | 23.5 | 25.8 | 27.5 | 29.5 | 31.2 | | | |
| L = 480° φ = 40° | 58.7 | 0.2 | 1.7 | 3.2 | 5.0 | 6.8 | 8.8 | 11.0 | 13.3 | 15.8 | 18.5 | 21.0 | 23.7 | 26.0 | 28.2 | 30.0 | 31.8 | 33.7 | 35.2 | 36.7 | 38.2 |
| 30° | | 58.7 | 0.0 | 1.7 | 3.3 | 5.2 | 7.2 | 9.3 | 11.8 | 14.5 | 17.3 | 20.2 | 22.8 | 25.2 | 27.5 | 29.5 | 31.2 | 33.0 | 34.5 | 36.0 | |
| 20° | | | 59.0 | 0.5 | 2.2 | 4.0 | 6.0 | 8.2 | 10.7 | 13.5 | 16.5 | 19.5 | 22.3 | 24.8 | 27.0 | 29.0 | 30.8 | 32.5 | 34.0 | | |
| 10° | | | | 59.5 | 1.2 | 3.0 | 5.0 | 7.2 | 9.7 | 12.7 | 15.7 | 18.8 | 21.8 | 24.2 | 26.3 | 28.3 | 30.2 | 31.8 | | | |
| 0° | | | | 58.8 | 0.3 | 2.2 | 4.2 | 6.5 | 9.0 | 11.8 | 15.0 | 18.2 | 21.2 | 23.7 | 25.8 | 27.8 | 29.7 | 31.2 | | | |
| L = 490° φ = 40° | 58.7 | 0.2 | 1.7 | 3.2 | 5.0 | 6.8 | 8.8 | 11.0 | 13.3 | 15.8 | 18.5 | 21.0 | 23.5 | 25.8 | 28.0 | 30.0 | 31.8 | 33.5 | 35.2 | 36.7 | 38.2 |
| 30° | | 58.7 | 0.2 | 1.5 | 3.3 | 5.2 | 7.2 | 9.5 | 11.8 | 14.7 | 17.5 | 20.2 | 22.8 | 25.3 | 27.5 | 29.5 | 31.2 | 32.8 | 34.5 | 36.0 | |
| 20° | | | 58.8 | 0.3 | 2.2 | 3.8 | 6.0 | 8.2 | 10.8 | 13.5 | 16.5 | 19.5 | 22.3 | 24.8 | 27.0 | 28.8 | 30.7 | 32.3 | 33.8 | | |
| 10° | | | | 59.5 | 1.2 | 3.0 | 5.0 | 7.2 | 9.8 | 12.7 | 15.8 | 19.0 | 21.7 | 24.2 | 26.3 | 28.3 | 30.2 | 31.7 | | | |
| 0° | | | | 58.8 | 0.5 | 2.5 | 4.3 | 6.5 | 9.2 | 12.2 | 15.3 | 18.5 | 21.3 | 23.7 | 25.8 | 27.8 | 29.5 | 31.3 | | | |
| L = 500° φ = 40° | | 59.7 | 1.3 | 2.8 | 4.7 | 6.5 | 8.5 | 10.7 | 13.0 | 15.5 | 18.0 | 20.7 | 23.2 | 25.5 | 27.7 | 29.7 | 31.5 | 33.2 | 34.8 | 36.3 | 37.7 |
| 30° | | | 59.6 | 1.3 | 3.2 | 5.0 | 7.0 | 9.2 | 11.7 | 14.3 | 17.2 | 20.0 | 22.7 | 25.0 | 27.2 | 29.2 | 30.8 | 32.5 | 34.2 | 35.5 | |
| 20° | | | 58.8 | 0.3 | 2.0 | 3.8 | 6.0 | 8.2 | 10.5 | 13.7 | 16.7 | 19.5 | 22.3 | 24.7 | 26.8 | 28.7 | 30.5 | 32.2 | 33.7 | | |
| 10° | | | | 59.3 | 1.2 | 3.0 | 5.0 | 7.3 | 10.0 | 12.8 | 16.0 | 19.0 | 21.8 | 24.2 | 26.3 | 28.3 | 30.0 | 31.7 | | | |
| 0° | | | | 58.8 | 0.5 | 2.3 | 4.5 | 6.8 | 9.5 | 12.5 | 15.7 | 18.7 | 21.5 | 23.8 | 25.8 | 27.8 | 29.5 | 31.2 | | | |

# TABLE D.

| λ + μ. | 260° | 270° | 280° | 290° | 300° | 310° | 320° | 330° | 340° | 350° | 0° | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° | 100° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L = 510° φ = 40° | | 59.3 | 1.0 | 2.5 | 4.3 | 6.2 | 8.2 | 10.3 | 12.7 | 15.2 | 17.8 | 20.3 | 22.8 | 25.2 | 27.3 | 29.2 | 31.0 | 32.7 | 34.3 | 36.0 | 37.3 |
| 30° | | | 59.7 | 1.3 | 3.0 | 4.8 | 6.8 | 9.2 | 11.7 | 14.3 | 17.0 | 20.0 | 22.5 | 24.8 | 27.0 | 28.8 | 30.7 | 32.3 | 33.8 | 35.3 | |
| 20° | | | 58.7 | 0.3 | 2.0 | 3.8 | 5.8 | 8.2 | 10.8 | 13.7 | 16.5 | 19.5 | 22.2 | 24.5 | 26.7 | 28.7 | 30.3 | 32.0 | 33.5 | | |
| 10° | | | | 59.5 | 1.2 | 3.0 | 5.2 | 7.5 | 10.0 | 13.0 | 16.2 | 19.0 | 21.8 | 24.2 | 26.2 | 28.2 | 29.8 | 31.5 | | | |
| 0° | | | | 58.8 | 0.7 | 2.5 | 4.5 | 6.8 | 9.5 | 12.7 | 15.8 | 18.8 | 21.3 | 23.8 | 25.8 | 27.8 | 29.5 | 31.0 | | | |
| L = 520° φ = 40° | | 59.6 | 0.5 | 2.2 | 3.8 | 5.7 | 7.7 | 9.8 | 12.2 | 14.7 | 17.3 | 19.8 | 22.3 | 24.5 | 26.7 | 28.7 | 30.5 | 32.2 | 33.8 | 35.3 | 36.8 |
| 30° | | | 59.2 | 0.8 | 2.5 | 4.5 | 6.5 | 8.7 | 11.2 | 13.8 | 16.7 | 19.3 | 21.8 | 24.3 | 26.3 | 28.3 | 30.2 | 31.8 | 33.3 | 34.8 | |
| 20° | | | 58.5 | 0.2 | 1.8 | 3.8 | 5.7 | 8.0 | 10.7 | 13.3 | 16.3 | 19.2 | 21.8 | 24.2 | 26.3 | 28.2 | 30.0 | 31.7 | 33.2 | | |
| 10° | | | | 59.8 | 1.0 | 2.8 | 5.0 | 7.3 | 10.0 | 13.0 | 16.0 | 18.8 | 21.5 | 23.8 | 25.0 | 27.8 | 29.7 | 31.2 | 32.7 | | |
| 0° | | | | 59.0 | 0.7 | 2.7 | 4.7 | 7.2 | 9.8 | 12.8 | 15.8 | 18.8 | 21.5 | 23.8 | 25.8 | 27.7 | 29.3 | 31.0 | | | |
| L = 530° φ = 40° | | 58.5 | 0.0 | 1.7 | 3.3 | 5.3 | 7.3 | 9.3 | 11.7 | 14.2 | 16.7 | 19.2 | 21.7 | 24.0 | 26.2 | 28.0 | 29.8 | 31.7 | 33.2 | 34.8 | 36.2 |
| 30° | | | 59.0 | 0.7 | 2.3 | 4.2 | 6.3 | 8.5 | 11.0 | 13.5 | 16.3 | 19.0 | 21.5 | 23.8 | 26.0 | 28.0 | 29.8 | 31.5 | 33.0 | 34.5 | |
| 20° | | | | 59.8 | 1.7 | 3.5 | 5.5 | 7.8 | 10.3 | 13.2 | 16.0 | 18.8 | 21.5 | 23.8 | 26.0 | 27.8 | 29.7 | 31.3 | 32.8 | | |
| 10° | | | | 59.3 | 1.0 | 3.0 | 5.2 | 7.3 | 10.0 | 13.0 | 16.0 | 18.8 | 21.3 | 23.8 | 25.8 | 27.7 | 29.5 | 31.0 | 32.5 | | |
| 0° | | | | 59.0 | 0.8 | 2.7 | 4.8 | 7.3 | 10.0 | 13.0 | 16.0 | 18.8 | 21.8 | 23.7 | 25.7 | 27.7 | 29.3 | 30.8 | | | |
| L = 540° φ = 40° | | | 59.5 | 1.2 | 2.8 | 4.7 | 6.7 | 8.8 | 11.0 | 13.5 | 16.0 | 18.5 | 20.8 | 23.2 | 25.3 | 27.3 | 29.2 | 30.8 | 32.5 | 34.0 | 35.5 |
| 30° | | | 58.7 | 0.3 | 2.0 | 3.8 | 5.8 | 8.0 | 10.5 | 13.0 | 15.7 | 18.3 | 21.0 | 23.3 | 25.5 | 27.3 | 29.2 | 30.8 | 32.5 | 34.0 | |
| 20° | | | | 59.8 | 1.5 | 3.3 | 5.3 | 7.7 | 10.2 | 12.8 | 15.7 | 18.5 | 21.2 | 23.5 | 25.7 | 27.5 | 29.3 | 31.0 | 32.5 | | |
| 10° | | | | 59.2 | 1.0 | 2.8 | 4.8 | 7.2 | 9.8 | 12.7 | 15.7 | 18.5 | 21.0 | 23.5 | 25.5 | 27.5 | 29.2 | 30.8 | 32.3 | | |
| 0° | | | | 59.2 | 0.8 | 2.8 | 4.8 | 7.3 | 10.0 | 12.8 | 16.0 | 18.7 | 21.3 | 23.7 | 25.7 | 27.5 | 29.2 | 30.8 | | | |
| L = 550° φ = 40° | | | 59.0 | 0.7 | 2.3 | 4.0 | 6.0 | 8.2 | 10.3 | 12.8 | 15.2 | 17.7 | 20.2 | 22.5 | 24.7 | 26.7 | 28.5 | 30.2 | 31.8 | 33.5 | |
| 30° | | | 58.3 | 0.0 | 1.7 | 3.5 | 5.5 | 7.7 | 10.0 | 12.5 | 15.2 | 17.8 | 20.3 | 22.7 | 24.8 | 26.8 | 28.7 | 30.3 | 32.0 | 33.5 | |
| 20° | | | | 59.5 | 1.2 | 3.0 | 5.0 | 7.2 | 9.7 | 12.3 | 15.2 | 18.0 | 20.5 | 22.8 | 25.0 | 27.0 | 28.8 | 30.5 | 32.0 | | |
| 10° | | | | 59.3 | 1.0 | 2.8 | 4.5 | 7.2 | 9.8 | 12.5 | 15.5 | 18.3 | 20.8 | 23.2 | 25.3 | 27.2 | 29.0 | 30.7 | 32.2 | | |
| 0° | | | | 59.3 | 1.0 | 2.8 | 5.0 | 7.3 | 10.0 | 12.8 | 15.8 | 18.5 | 21.2 | 23.5 | 25.5 | 27.5 | 29.0 | 30.7 | | | |
| L = 560° φ = 40° | | | 58.2 | 59.8 | 1.5 | 3.3 | 5.3 | 7.3 | 9.5 | 11.8 | 14.3 | 16.8 | 19.2 | 21.5 | 23.7 | 25.7 | 27.7 | 29.5 | 31.2 | 32.7 | |
| 30° | | | | 59.5 | 1.3 | 3.0 | 5.0 | 7.2 | 9.5 | 12.0 | 14.5 | 17.2 | 19.7 | 22.0 | 24.3 | 26.3 | 28.2 | 30.0 | 31.7 | 33.2 | |
| 20° | | | | 59.3 | 1.0 | 2.8 | 4.8 | 7.0 | 9.3 | 12.0 | 14.7 | 17.5 | 20.2 | 22.5 | 24.7 | 26.7 | 28.5 | 30.3 | 31.8 | | |
| 10° | | | | 59.2 | 0.8 | 2.7 | 4.7 | 7.0 | 9.5 | 12.2 | 15.0 | 17.8 | 20.5 | 22.8 | 25.0 | 27.0 | 28.8 | 30.5 | | | |
| 0° | | | | 59.3 | 1.0 | 2.8 | 5.0 | 7.3 | 9.8 | 12.7 | 15.5 | 18.3 | 21.0 | 23.3 | 25.3 | 27.3 | 29.0 | 30.7 | | | |
| L = 570° φ = 40° | | | | 59.3 | 1.0 | 2.8 | 4.7 | 6.7 | 8.8 | 11.2 | 13.7 | 16.0 | 18.5 | 20.8 | 23.0 | 25.0 | 27.0 | 28.8 | 30.5 | 32.0 | |
| 30° | | | | 59.2 | 0.8 | 2.5 | 4.5 | 6.5 | 8.8 | 11.3 | 13.8 | 16.3 | 19.0 | 21.3 | 23.7 | 25.7 | 27.7 | 29.3 | 31.0 | | |
| 20° | | | | 59.2 | 0.8 | 2.7 | 4.7 | 6.7 | 9.0 | 11.7 | 14.3 | 17.0 | 19.7 | 22.2 | 24.3 | 26.3 | 28.3 | 30.0 | 31.7 | | |
| 10° | | | | 59.2 | 0.8 | 2.7 | 4.7 | 6.8 | 9.3 | 12.0 | 14.5 | 17.7 | 20.3 | 22.7 | 24.8 | 26.8 | 28.7 | 30.3 | 32.0 | | |
| 0° | | | | 59.3 | 1.0 | 2.8 | 5.0 | 7.2 | 9.7 | 12.5 | 15.3 | 18.2 | 20.7 | 23.2 | 25.3 | 27.2 | 29.0 | 30.7 | | | |
| L = 580° φ = 40° | | | | 58.8 | 0.5 | 2.2 | 4.2 | 6.2 | 8.2 | 10.5 | 12.8 | 15.3 | 17.8 | 20.2 | 22.3 | 24.5 | 26.5 | 28.3 | 30.0 | 31.7 | |
| 30° | | | | 58.7 | 0.3 | 2.2 | 4.0 | 6.2 | 8.3 | 10.7 | 13.2 | 15.8 | 18.5 | 20.8 | 23.2 | 25.3 | 27.2 | 29.0 | 30.7 | | |
| 20° | | | | 58.8 | 0.5 | 2.3 | 4.2 | 6.2 | 8.5 | 11.0 | 13.7 | 16.5 | 19.2 | 21.7 | 24.0 | 26.0 | 27.8 | 29.7 | 31.3 | | |
| 10° | | | | 59.0 | 0.7 | 2.5 | 4.3 | 6.5 | 9.0 | 11.5 | 14.3 | 17.2 | 19.8 | 22.3 | 24.7 | 26.7 | 28.5 | 30.2 | | | |
| 0° | | | | 59.3 | 1.0 | 2.8 | 4.8 | 7.0 | 9.5 | 12.2 | 15.0 | 17.8 | 20.5 | 23.0 | 25.2 | 27.2 | 29.0 | 30.7 | | | |

# TABLE D.

| λ ÷ α | 260° | 270° | 280° | 290° | 300° | 310° | 320° | 330° | 340° | 350° | 0° | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° | 100° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L. = 590° φ = 40° | | | | 58.3 | 0.6 | 1.7 | 3.5 | 5.5 | 7.7 | 9.8 | 12.2 | 14.7 | 17.2 | 19.5 | 21.8 | 24.0 | 25.8 | 27.8 | 29.5 | | |
| 30° | | | | 58.5 | 0.2 | 1.8 | 3.7 | 5.7 | 7.8 | 10.2 | 12.7 | 15.3 | 18.0 | 20.5 | 22.7 | 24.8 | 26.8 | 28.7 | 30.3 | | |
| 20° | | | | 58.5 | 0.2 | 1.8 | 3.7 | 5.8 | 8.0 | 10.5 | 13.2 | 15.8 | 18.7 | 21.2 | 23.5 | 25.7 | 27.5 | 29.3 | 31.0 | | |
| 10° | | | | 58.8 | 0.5 | 2.3 | 4.2 | 6.3 | 8.7 | 11.2 | 13.8 | 16.7 | 19.5 | 22.0 | 24.3 | 26.5 | 28.3 | 30.0 | | | |
| 0° | | | | 59.3 | 1.0 | 2.8 | 4.7 | 6.8 | 9.3 | 11.8 | 14.7 | 17.5 | 20.3 | 22.7 | 25.0 | 27.2 | 29.0 | 30.7 | | | |
| L. = 600° φ = 40° | | | | | 59.5 | 1.2 | 3.0 | 5.0 | 7.0 | 9.3 | 11.7 | 14.2 | 16.5 | 19.0 | 21.3 | 23.5 | 25.5 | 27.3 | 29.0 | | |
| 30° | | | | | 59.7 | 1.3 | 3.2 | 5.2 | 7.2 | 9.7 | 12.2 | 14.7 | 17.3 | 19.8 | 22.2 | 24.4 | 26.3 | 28.2 | 30.0 | | |
| 20° | | | | 58.3 | 0.0 | 1.7 | 3.5 | 5.5 | 7.7 | 10.2 | 12.8 | 15.7 | 18.3 | 21.0 | 23.3 | 25.5 | 27.3 | 29.2 | | | |
| 10° | | | | 58.8 | 0.5 | 2.2 | 4.0 | 6.0 | 8.3 | 11.0 | 13.7 | 16.5 | 19.3 | 22.0 | 24.3 | 26.5 | 28.3 | 30.2 | | | |
| 0° | | | | 59.3 | 1.0 | 2.7 | 4.7 | 6.7 | 9.0 | 11.7 | 14.5 | 17.3 | 20.2 | 22.7 | 25.0 | 27.2 | 29.0 | 30.7 | | | |
| L. = 610° φ = 40° | | | | | 58.5 | 0.7 | 2.5 | 4.3 | 6.3 | 8.7 | 11.0 | 13.5 | 16.0 | 18.3 | 20.7 | 22.8 | 24.8 | 26.5 | | | |
| 30° | | | | | 59.3 | 1.0 | 2.8 | 4.7 | 6.8 | 9.2 | 11.7 | 14.3 | 17.0 | 19.5 | 22.0 | 24.2 | 26.2 | 28.0 | | | |
| 20° | | | | | 59.8 | 1.5 | 3.3 | 5.3 | 7.5 | 9.8 | 12.5 | 15.3 | 18.2 | 20.8 | 23.2 | 25.3 | 27.3 | 29.2 | | | |
| 10° | | | | 58.7 | 0.3 | 2.0 | 3.8 | 5.8 | 8.2 | 10.7 | 13.3 | 16.3 | 19.2 | 21.8 | 24.2 | 26.3 | 28.3 | 30.0 | | | |
| 0° | | | | 59.3 | 1.0 | 2.7 | 4.5 | 6.5 | 8.8 | 11.5 | 14.2 | 17.2 | 20.0 | 22.7 | 25.0 | 27.2 | 29.0 | 30.7 | | | |
| L. = 620° φ = 40° | | | | | 58.5 | 0.2 | 2.0 | 3.8 | 6.0 | 8.2 | 10.5 | 13.0 | 15.5 | 18.0 | 20.3 | 22.5 | 24.5 | 26.5 | | | |
| 30° | | | | | 59.0 | 0.7 | 2.5 | 4.5 | 6.5 | 8.8 | 11.3 | 14.0 | 16.7 | 19.3 | 21.7 | 24.0 | 26.0 | 27.8 | | | |
| 20° | | | | | 59.5 | 1.2 | 3.0 | 4.8 | 7.2 | 9.5 | 12.2 | 14.8 | 17.8 | 20.5 | 23.0 | 25.2 | 27.2 | 29.0 | | | |
| 10° | | | | 58.7 | 0.2 | 1.8 | 3.7 | 5.7 | 8.0 | 10.5 | 13.3 | 16.2 | 19.2 | 21.8 | 24.3 | 26.5 | 28.3 | 30.2 | | | |
| 0° | | | | 59.2 | 0.8 | 2.5 | 4.3 | 6.3 | 8.7 | 11.3 | 14.0 | 17.2 | 20.0 | 22.7 | 25.2 | 27.2 | 29.2 | 30.8 | | | |
| L. = 630° φ = 40° | | | | | | 59.7 | 1.5 | 3.5 | 5.5 | 7.8 | 10.2 | 12.7 | 15.3 | 17.7 | 20.0 | 22.3 | 24.3 | 26.2 | | | |
| 30° | | | | | 58.7 | 0.3 | 2.2 | 4.2 | 6.2 | 8.7 | 11.2 | 13.8 | 16.5 | 19.2 | 21.7 | 23.8 | 25.8 | 27.7 | | | |
| 20° | | | | | 59.3 | 1.0 | 2.7 | 4.7 | 7.0 | 9.3 | 12.0 | 15.0 | 17.8 | 20.5 | 22.8 | 25.2 | 27.2 | 29.0 | | | |
| 10° | | | | 58.5 | 0.0 | 1.7 | 3.5 | 5.5 | 7.8 | 10.3 | 13.2 | 16.0 | 19.0 | 21.7 | 24.2 | 26.3 | 28.3 | 30.2 | | | |
| 0° | | | | 59.2 | 0.7 | 2.3 | 4.3 | 6.3 | 8.7 | 11.2 | 14.0 | 17.0 | 20.0 | 22.5 | 25.2 | 27.3 | 29.2 | 31.0 | | | |
| L. = 640° φ = 40° | | | | | | 59.5 | 1.3 | 3.3 | 5.3 | 7.7 | 10.2 | 12.7 | 15.2 | 17.7 | 20.0 | 22.2 | 24.3 | | | | |
| 30° | | | | | 58.5 | 0.2 | 2.0 | 4.0 | 6.2 | 8.7 | 11.2 | 14.0 | 16.7 | 19.3 | 21.8 | 24.0 | 26.0 | 27.8 | | | |
| 20° | | | | | 59.2 | 0.8 | 2.7 | 4.7 | 6.8 | 9.3 | 12.2 | 15.0 | 17.8 | 20.7 | 23.0 | 25.2 | 27.2 | 29.0 | | | |
| 10° | | | | | 0.0 | 1.7 | 3.5 | 5.5 | 7.8 | 10.3 | 13.2 | 16.3 | 19.2 | 22.0 | 24.3 | 26.5 | 28.5 | 30.3 | | | |
| 0° | | | | 59.0 | 0.7 | 2.3 | 4.2 | 6.2 | 8.5 | 11.2 | 14.2 | 17.2 | 20.2 | 22.8 | 25.3 | 27.3 | 29.3 | 31.0 | | | |
| L. = 650° φ = 40° | | | | | | 59.3 | 1.2 | 3.2 | 5.3 | 7.7 | 10.2 | 12.7 | 15.3 | 17.8 | 20.2 | 22.3 | 24.2 | | | | |
| 30° | | | | | 58.3 | 0.0 | 1.8 | 3.8 | 6.0 | 8.5 | 11.2 | 14.0 | 16.7 | 19.3 | 21.7 | 23.8 | 25.8 | | | | |
| 20° | | | | | 59.0 | 0.7 | 2.5 | 4.5 | 6.8 | 9.3 | 12.2 | 15.2 | 18.2 | 20.7 | 23.2 | 25.3 | 27.3 | | | | |
| 10° | | | | | 59.8 | 1.5 | 3.3 | 5.3 | 7.7 | 10.3 | 13.2 | 16.3 | 19.3 | 22.0 | 24.5 | 26.5 | 28.5 | 30.2 | | | |
| 0° | | | | 59.6 | 0.5 | 2.2 | 4.2 | 6.2 | 8.7 | 11.2 | 14.2 | 17.3 | 20.5 | 23.2 | 25.5 | 27.5 | 29.3 | 31.2 | | | |
| L. = 660° φ = 40° | | | | | | 59.3 | 1.2 | 3.2 | 5.5 | 7.8 | 10.3 | 13.0 | 15.5 | 18.0 | 20.3 | 22.3 | 24.3 | | | | |
| 30° | | | | | 58.3 | 0.2 | 2.0 | 4.0 | 6.3 | 8.8 | 11.5 | 14.3 | 17.2 | 19.7 | 22.0 | 24.2 | 26.2 | | | | |
| 20° | | | | | 59.0 | 0.7 | 2.7 | 4.7 | 7.0 | 9.7 | 12.5 | 15.5 | 18.5 | 21.0 | 23.5 | 25.5 | 27.5 | | | | |
| 10° | | | | | 59.7 | 1.3 | 3.3 | 5.5 | 7.8 | 10.5 | 13.5 | 16.7 | 19.7 | 22.3 | 24.7 | 26.7 | 28.7 | 30.3 | | | |
| 0° | | | | 58.8 | 0.5 | 2.2 | 4.2 | 6.3 | 8.6 | 11.3 | 14.3 | 17.5 | 20.5 | 23.2 | 25.5 | 27.7 | 29.5 | 31.2 | | | |

# TABLE D.

| λ + μ | 260° | 270° | 280° | 290° | 300° | 310° | 320° | 330° | 340° | 350° | 0° | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° | 100° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L. = 670° φ = 40° | | | | | | 59.3 | 1.3 | 3.3 | 5.7 | 8.2 | 10.7 | 13.3 | 16.0 | 18.3 | 20.5 | 22.7 | 24.5 | | | | |
| 30° | | | | | 58.3 | 0.2 | 2.0 | 4.2 | 6.5 | 9.2 | 11.8 | 14.7 | 17.5 | 20.0 | 22.2 | 24.3 | 26.2 | | | | |
| 20° | | | | | 59.0 | 0.8 | 2.7 | 5.0 | 7.3 | 10.0 | 13.0 | 16.0 | 18.8 | 21.3 | 23.7 | 25.8 | 27.7 | | | | |
| 10° | | | | | 59.8 | 1.5 | 3.5 | 5.7 | 8.0 | 10.8 | 13.6 | 17.0 | 20.0 | 22.7 | 24.8 | 26.8 | 28.7 | 30.5 | | | |
| 0° | | | | 58.9 | 0.5 | 2.2 | 4.2 | 6.3 | 8.7 | 11.5 | 14.7 | 17.8 | 20.8 | 23.5 | 25.7 | 27.7 | 29.5 | 31.2 | | | |
| L. = 680° φ = 40° | | | | | | 59.8 | 1.8 | 3.8 | 6.2 | 8.7 | 11.3 | 14.0 | 16.5 | 18.8 | 21.0 | 23.0 | 24.8 | | | | |
| 30° | | | | | 58.7 | 0.5 | 2.5 | 4.7 | 7.0 | 9.7 | 12.5 | 15.3 | 18.0 | 20.5 | 22.7 | 24.7 | 26.5 | | | | |
| 20° | | | | | 59.2 | 1.0 | 3.0 | 5.2 | 7.7 | 10.3 | 13.3 | 16.3 | 19.2 | 21.7 | 24.0 | 26.0 | 27.8 | | | | |
| 10° | | | | | 59.8 | 1.5 | 3.5 | 5.8 | 8.3 | 11.2 | 14.2 | 17.3 | 20.2 | 22.8 | 25.0 | 27.0 | 28.8 | | | | |
| 0° | | | | 58.8 | 0.3 | 2.2 | 4.2 | 6.3 | 8.8 | 11.8 | 15.0 | 18.2 | 21.0 | 23.5 | 25.8 | 27.8 | 29.7 | 31.2 | | | |
| L. = 690° φ = 40° | | | | | 58.3 | 0.2 | 2.2 | 4.5 | 6.8 | 9.3 | 12.0 | 14.5 | 17.0 | 19.3 | 21.5 | 23.5 | | | | | |
| 30° | | | | | 58.8 | 0.7 | 2.7 | 5.0 | 7.5 | 10.2 | 13.0 | 15.8 | 18.3 | 20.8 | 23.0 | 25.0 | 26.7 | | | | |
| 20° | | | | | 59.3 | 1.2 | 3.2 | 5.5 | 8.0 | 10.7 | 13.8 | 16.8 | 19.5 | 22.0 | 24.2 | 26.2 | 27.8 | | | | |
| 10° | | | | | 59.8 | 1.7 | 3.7 | 6.0 | 8.5 | 11.3 | 14.5 | 17.7 | 20.5 | 23.0 | 25.2 | 27.2 | 28.8 | | | | |
| 0° | | | | 58.8 | 0.5 | 2.2 | 4.2 | 6.5 | 9.0 | 12.0 | 15.2 | 18.3 | 21.2 | 23.7 | 25.8 | 27.8 | 29.5 | 31.2 | | | |
| L. = 700° φ = 40° | | | | | 59.0 | 0.8 | 2.8 | 5.2 | 7.5 | 10.2 | 12.7 | 15.3 | 17.8 | 20.0 | 22.2 | 24.0 | 25.8 | | | | |
| 30° | | | | | 59.3 | 1.2 | 3.3 | 5.7 | 8.2 | 10.8 | 13.7 | 16.5 | 19.0 | 21.3 | 23.5 | 25.5 | 27.2 | | | | |
| 20° | | | | | 59.7 | 1.5 | 3.5 | 5.8 | 8.3 | 11.3 | 14.3 | 17.2 | 19.8 | 22.3 | 24.5 | 26.3 | 28.2 | | | | |
| 10° | | | | 58.5 | 0.2 | 2.0 | 4.0 | 6.3 | 8.8 | 11.8 | 15.0 | 18.0 | 20.8 | 23.3 | 25.3 | 27.2 | 29.0 | | | | |
| 0° | | | | 58.8 | 0.5 | 2.3 | 4.3 | 6.7 | 9.2 | 12.2 | 15.3 | 18.5 | 21.3 | 23.7 | 25.8 | 27.8 | 29.5 | 31.2 | | | |
| L. = 710° φ = 40° | | | | | 59.5 | 1.3 | 3.5 | 5.8 | 8.2 | 10.8 | 13.3 | 16.0 | 18.3 | 20.5 | 22.7 | 24.5 | 26.3 | | | | |
| 30° | | | | | 59.7 | 1.7 | 3.7 | 6.0 | 8.7 | 11.3 | 14.2 | 16.8 | 19.5 | 21.7 | 23.8 | 25.7 | 27.5 | | | | |
| 20° | | | | | 59.8 | 1.8 | 3.8 | 6.2 | 8.8 | 11.7 | 14.7 | 17.7 | 20.2 | 22.7 | 24.7 | 26.7 | 28.3 | | | | |
| 10° | | | | 58.5 | 0.2 | 2.2 | 4.2 | 6.5 | 9.2 | 12.0 | 15.2 | 18.2 | 21.0 | 23.3 | 25.5 | 27.3 | 29.2 | | | | |
| 0° | | | | 58.8 | 0.5 | 2.3 | 4.3 | 6.8 | 9.3 | 12.3 | 15.5 | 18.5 | 21.3 | 23.7 | 25.8 | 27.8 | 29.5 | 31.2 | | | |
| L. = 720° φ = 40° | | | | 58.3 | 0.2 | 2.2 | 4.2 | 6.5 | 9.0 | 11.5 | 14.2 | 16.7 | 19.0 | 21.3 | 23.3 | 25.2 | 26.8 | | | | |
| 30° | | | | 58.5 | 0.2 | 2.2 | 4.2 | 6.5 | 9.2 | 11.8 | 14.7 | 17.3 | 19.8 | 22.2 | 24.3 | 26.2 | 27.8 | | | | |
| 20° | | | | 58.5 | 0.2 | 2.0 | 4.2 | 6.5 | 9.2 | 12.0 | 15.0 | 17.8 | 20.5 | 22.8 | 25.0 | 26.8 | 28.5 | | | | |
| 10° | | | | 58.8 | 0.5 | 2.3 | 4.3 | 6.7 | 9.3 | 12.3 | 15.5 | 18.3 | 21.2 | 23.7 | 25.7 | 27.5 | 29.3 | | | | |
| 0° | | | | 58.8 | 0.5 | 2.3 | 4.5 | 6.7 | 9.3 | 12.3 | 15.5 | 18.5 | 21.3 | 23.7 | 25.8 | 27.7 | 29.5 | 31.2 | | | |
| L. = 730° φ = 40° | | | | 59.0 | 0.8 | 2.8 | 4.8 | 7.2 | 9.7 | 12.2 | 14.8 | 17.3 | 19.7 | 21.8 | 23.8 | 25.7 | 27.5 | | | | |
| 30° | | | | 58.8 | 0.7 | 2.7 | 4.7 | 7.0 | 9.7 | 12.3 | 15.2 | 17.8 | 20.3 | 22.7 | 24.7 | 26.5 | 28.3 | | | | |
| 20° | | | | 58.8 | 0.7 | 2.5 | 4.7 | 7.0 | 9.7 | 12.5 | 15.5 | 18.3 | 20.8 | 23.2 | 25.3 | 27.2 | 28.8 | | | | |
| 10° | | | | 58.8 | 0.5 | 2.3 | 4.5 | 6.8 | 9.5 | 12.3 | 15.5 | 18.5 | 21.2 | 23.5 | 25.7 | 27.5 | 29.2 | 30.8 | | | |
| 0° | | | | 58.8 | 0.7 | 2.5 | 4.5 | 6.8 | 9.5 | 12.3 | 15.3 | 18.5 | 21.2 | 23.7 | 25.8 | 27.7 | 29.5 | 31.2 | | | |
| L. = 740° φ = 40° | | | | 59.6 | 1.7 | 3.5 | 5.7 | 8.0 | 10.3 | 13.0 | 15.5 | 18.0 | 20.3 | 22.5 | 24.5 | 26.3 | 28.2 | | | | |
| 30° | | | | 59.3 | 1.2 | 3.0 | 5.2 | 7.5 | 10.0 | 12.7 | 15.5 | 18.2 | 20.7 | 23.0 | 25.0 | 26.8 | 28.7 | | | | |
| 20° | | | | 59.2 | 1.0 | 2.8 | 4.8 | 7.2 | 9.8 | 12.7 | 15.5 | 18.3 | 21.0 | 23.3 | 25.5 | 27.3 | 29.0 | 30.7 | | | |
| 10° | | | | 59.0 | 0.8 | 2.7 | 4.7 | 7.0 | 9.7 | 12.5 | 15.5 | 18.5 | 21.2 | 23.7 | 25.7 | 27.7 | 29.3 | 31.0 | | | |
| 0° | | | | 59.0 | 0.7 | 2.5 | 4.5 | 6.8 | 9.3 | 12.2 | 15.3 | 18.3 | 21.0 | 23.5 | 25.7 | 27.7 | 29.3 | 31.0 | | | |

# TABLE D.

| $\lambda - \mu$ | 260° | 270° | 280° | 290° | 300° | 310° | 320° | 330° | 340° | 350° | 0° | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° | 100° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L = 750° δ = 40° | | | 58.7 | 0.3 | 2.2 | 4.2 | 6.2 | 8.3 | 10.8 | 13.3 | 16.0 | 18.5 | 20.8 | 23.0 | 25.2 | 27.0 | 28.7 | 30.3 | | | |
| 30° | | | | 59.8 | 1.7 | 3.5 | 5.7 | 8.0 | 10.5 | 13.2 | 16.0 | 18.7 | 21.2 | 23.3 | 25.5 | 27.3 | 29.2 | 30.8 | | | |
| 20° | | | | 59.3 | 1.2 | 3.0 | 5.0 | 7.3 | 10.0 | 12.7 | 15.7 | 18.5 | 21.2 | 23.5 | 25.6 | 27.5 | 29.2 | 30.8 | | | |
| 10° | | | | 59.2 | 0.8 | 2.7 | 4.7 | 7.0 | 9.7 | 12.5 | 15.5 | 18.3 | 21.2 | 23.5 | 25.7 | 27.7 | 29.3 | 31.0 | | | |
| 0° | | | | 59.0 | 0.7 | 2.5 | 4.5 | 6.8 | 9.3 | 12.2 | 15.2 | 18.2 | 21.0 | 23.5 | 25.7 | 27.7 | 29.3 | 31.0 | | | |
| L = 760° δ = 40° | | | 59.2 | 0.8 | 2.7 | 4.7 | 6.7 | 8.8 | 11.3 | 13.8 | 16.3 | 18.8 | 21.3 | 23.5 | 25.5 | 27.5 | 29.2 | 30.8 | | | |
| 30° | | | 58.7 | 0.2 | 2.0 | 4.0 | 6.0 | 8.2 | 10.7 | 13.5 | 16.2 | 18.8 | 21.3 | 23.7 | 25.8 | 27.7 | 29.5 | 31.2 | | | |
| 20° | | | | 59.7 | 1.5 | 3.3 | 5.3 | 7.5 | 10.2 | 13.0 | 15.8 | 18.7 | 21.3 | 23.7 | 25.8 | 27.8 | 29.5 | 31.2 | | | |
| 10° | | | | 59.3 | 1.0 | 2.8 | 4.8 | 7.0 | 9.7 | 12.5 | 15.5 | 18.5 | 21.2 | 23.7 | 25.8 | 27.8 | 29.5 | 31.2 | | | |
| 0° | | | | 59.0 | 0.7 | 2.5 | 4.5 | 6.7 | 9.2 | 12.0 | 15.0 | 18.0 | 20.8 | 23.3 | 25.5 | 27.5 | 29.3 | 31.0 | | | |

# ADDITIONS AND CORRECTIONS.

*Art. 23, p. 9.*

A better description of the saṅkrântis may be given thus. The sâyana Mesha saṅkrânti, also called a Vishuva saṅkrânti, marks the vernal equinox, or the moment of the sun's passing the first point of Aries. The sâyana Karka saṅkrânti, three solar months later, is also called the dakshiṇâyana (southward-going) saṅkrânti. It is the point of the summer solstice, and marks the moment when the sun turns southward. The sâyana Tulâ saṅkrânti, three solar months later, also called a Vishuva saṅkrânti, marks the autumnal equinox or the moment of the sun's passing the first point of Libra. The sâyana Makara saṅkrânti, three solar months later still, is also called the uttarâyana (northward-going) saṅkrânti. It is the other solstitial point, the moment when the sun turns northward. The *nirayana* (or sidereal) Mesha and Tulâ saṅkrântis are also called Vishuva saṅkrântis, and the *nirayana* Karka and Makara saṅkrântis are also, though erroneously, called dakshiṇâyana and uttarâyana saṅkrântis.

*Art. 90, p. 52.*

*Line 6. After* "we proceed thus" *add*;—"The interval of time between the initial point of the luni-solar year (*Table I., Cols. 19, 20*) and the initial point of the solar year by the *Sûrya Siddhânta* (*Table I., Cols. 13, 14, and 15a, or 17a*[1]) can be easily found.

*Line 9. After* "Art. 151" *add*:—"or according to the process in Example 1, Art. 148."

*Line 16. After* "intercalations and suppressions" *add*;—We will give an example. In Professor Chhatre's Table, Kârttika is intercalary in Śaka 551 expired, A.D. 629—30 (see *Ind. Ant., XXIII.* p. 106); while in our Table Âśvina is the intercalary month for that year. Let us work for Âśvina. First we want the tithi-index (*t*) for the moments of the Kanyâ and Tulâ saṅkrântis. In the given year we have (*Table I., Col.* 19) the initial point of the luni-solar year at sunrise on 1st March, A.D. 629, (=60), and (*Cols. 13, 17*) the initial point of the solar year by the *Ârya-Siddhânta* (= 17 h. 32 m. after sunrise on March 19th of the same year). By the Table given below (p. 151) we find that the initial moment of the solar year by the *Sûrya Siddhânta* was 15 minutes later than that by the *Ârya Siddhânta*. Thus we have the interval between the initial points of the luni-solar and solar years, according to the *Sûrya Siddhânta*, as 18 days, 17 hours, and 47 minutes. Adding this to the collective duration up to the moment of the Kanyâ and Tulâ saṅkrântis (*Table III., Col. 9*), *i.e.*, 156 days, 11 hours and 52 minutes, and 186 days, 22 hours and 27 minutes respectively, we get 175 days, 5 hours, 39 minutes, and 205 days, 16 hours, 14 minutes.

We work for these moments according to the usual rules (Method C, p. 77).

| | *a.* | *b.* | *c.* |
|---|---|---|---|
| For the beginning of the luni-solar year (*Table I., Cols. 23, 24, 25*) | 9994 | 692 | 228 |
| For 175 days (*Table IV.*) . . . . . . . . . . . . | 9261 | 351 | 479 |
| For 5 hours (*Table V.*) . . . . . . . . . . . . . . | 71 | 8 | 1 |
| For 39 minutes (*Do.*) . . . . . . . . . . . . . . | 9 | 1 | 0 |
| | 9335 | 52 | 708 |

[1] Our *a, b, c, (Table I., Cols.* 23, 24, 25*)* are calculated by the *Sûrya Siddhânta*, and therefore we give the rule for the *Sûrya Siddhânta*. The time of the Mesha saṅkrânti by the *Ârya Siddhânta* from A.D. 1101 to 1900 is given in Table I. That for years from A.D. 300 to 1100 can be obtained from the Table on p. 151.

| | | | |
|---|---|---|---|
| over | 9335 | 52 | 708 |
| Equation for *b* (52) (*Table VI.*) | 186 | | |
| Do. for *c* (708) (*Table VII.*) | 119 | | |
| | 9640 | | |
| *Again* | *a.* | *b.* | *c.* |
| For the beginning of the luni-solar year | 9994 | 692 | 228 |
| For 205 days | 9420 | 440 | 561 |
| For 16 hours | 226 | 24 | 2 |
| For 14 minutes | 3 | 0 | 0 |
| | 9643 | 156 | 791 |
| Equation for (*b*) | 256 | | |
| Do. for (*c*) | 119 | | |
| | 18 | | |

This proves that the moon was waning at the Kanyâ sankrânti, and waxing at the Tulâ saṅkrânti, and therefore Âsvina was intercalary (*see Art. 45*). This being so, Kârttika could not have been intercalary.

The above constitutes an easy method of working out all the intercalations and suppressions of months. To still further simplify matters we give a Table shewing the sankrântis whose moments it is necessary to fix in order to establish these intercalations and suppressions. Equation *c* is always the same at the moment of the saṅkrântis and we give its figure here to save further reference.

| Months | Saṅkrântis to be fixed | | Equation *c* |
|---|---|---|---|
| 1 | 2 | | 3 |
| 1. Chaitra | Mîna | Mesha | 3 |
| 2. Vaisâkha | Mesha | Vṛishabha | 1 |
| 3. Jyeshṭha | Vṛishabha | Mithuna | 15 |
| 4. Âshâḍha | Mithuna | Karka | 42 |
| 5. Śrâvaṇa | Karka | Siṁha | 75 |
| 6. Bhâdrapada | Siṁha | Kanyâ | 103 |
| 7. Âśvina | Kanyâ | Tulâ | 119 |
| 8. Kârttika | Tulâ | Vṛischika | 119 |
| 9. Mârgasirsha | Vṛischika | Dhanus | 104 |
| 10. Pausha | Dhanus | Makara | 78 |
| 11. Mâgha | Makara | Kumbha | 47 |
| 12. Phâlguna | Kumbha | Mîna | 20 |

*Art. 96, Table, p. 55.*

Instead of this Table the following may be used. It shews the difference in time between the Mesha-saṅkrântis as calculated by the *Present Sûrya* and *First Ârya Siddhântas*, and will

save the trouble of making any calculation according to the Table in the text. But if great accuracy is required the latter will yield results correct up to 24 seconds, while the new Table gives it in minutes.

## TABLE

**Shewing time-difference in minutes between the moments of the Mesha saṅkrânti as calculated by the Present Sûrya and First Ârya Siddhântas.**

*[The sign — shews that the Mesha saṅkranti according to the Sûrya Siddhânta took place before, the sign + that it took place after, that according to the Ârya Siddhânta].*

| Years A.D. | Diff. in minutes. | Years A.D. | Diff. in minutes. | Years A.D. | Diff. in minutes. | Years A.D. | Diff. in minutes. |
|---|---|---|---|---|---|---|---|
| | — | | + | | + | | + |
| 300—8 | 21 | 501—9 | 1 | 703—11 | 23 | 904—12 | 45 |
| 309—17 | 20 | 510—19 | 2 | 712—20 | 24 | 913—21 | 46 |
| 318—27 | 19 | 520—28 | 3 | 721—29 | 25 | 922—30 | 47 |
| 328—36 | 18 | 529—37 | 4 | 730—38 | 26 | 931—39 | 48 |
| 337—45 | 17 | 538—46 | 5 | 739—47 | 27 | 940—48 | 49 |
| 346—54 | 16 | 547—55 | 6 | 748—56 | 28 | 949—58 | 50 |
| 355—63 | 15 | 556—64 | 7 | 757—66 | 29 | 959—67 | 51 |
| 364—72 | 14 | 565—73 | 8 | 767—75 | 30 | 968—76 | 52 |
| 373—81 | 13 | 574—83 | 9 | 776—84 | 31 | 977—85 | 53 |
| 382—91 | 12 | 584—92 | 10 | 785—93 | 32 | 986—94 | 54 |
| 392—400 | 11 | 593—601 | 11 | 794—802 | 33 | 995—1003 | 55 |
| 401—9 | 10 | 602—10 | 12 | 803—11 | 34 | 1004—13 | 56 |
| 410—18 | 9 | 611—19 | 13 | 812—20 | 35 | 1014—22 | 57 |
| 419—27 | 8 | 620—28 | 14 | 821—30 | 36 | 1023—31 | 58 |
| 428—36 | 7 | 629—38 | 15 | 831—39 | 37 | 1032—40 | 59 |
| 437—45 | 6 | 639—47 | 16 | 840—48 | 38 | 1041—49 | 60 |
| 446—55 | 5 | 648—56 | 17 | 849—57 | 39 | 1050—58 | 61 |
| 456—64 | 4 | 657—65 | 18 | 858—66 | 40 | 1059—67 | 62 |
| 465—73 | 3 | 666—74 | 19 | 867—75 | 41 | 1068—77 | 63 |
| 474—82 | 2 | 675—83 | 20 | 876—84 | 42 | 1078—86 | 64 |
| 483—91 | 1 | 684—92 | 21 | 885—94 | 43 | 1087—95 | 65 |
| 492—500 | 0 | 693—702 | 22 | 895—903 | 44 | 1096—1104 | 66 |

*Art. 102, pp. 56, 57.*

From the initial figures for the *w. a. b. c.* of luni-solar Kali 3402, A.D. 300—1, given in the first entry in Table I., and the figures given in the Table annexed to this article

(which gives the increase in *w. a. b. c.* for the different year-lengths) it is easy to calculate with exactness the initial *w. a. b. c.* for subsequent luni-solar years. Thus—

| | *w.* | *a.* | *b.* | *c.* | *(Our entries in Table I.)* *w.* | *a.* | *b.* | *c.* |
|---|---|---|---|---|---|---|---|---|
| For *Kali* 3402 | 6 | 9981·41 | 895·17 | 255 93 | 6 | 9981 | 895 | 256 |
| 355 days | 5 | 214·34 | 883·51 | 971·91 | | | | |
| For *Kali* 3403 | 4 | 195·75 | 778·68 | 227 84 | 4 | 196 | 779 | 228 |
| 384 days | 5 | 34·66 | 935·97 | 51·31 | | | | |
| For *Kali* 3404 | 3 | 230·41 | 714·65 | 279·15 | 3 | 230 | 715 | 279 |
| etc. | etc. | etc. | etc. | etc. | etc. | etc. | etc. | etc. |

To ascertain how many days there were in each year it is only necessary to use col. 19 of Table I. with Table IX. Kali 3403 began 26th February. Table IX. gives the figure 57 on left-hand side, and 422 on the right-hand side, the former being entered in our Table I.

But since A.D. 300 was a leap-year we must take, not 422, but 423, as the proper figure. Kali 3402 began 8th March (68). 423−68 = 355, and this in days was the length of Kali 3402. Similarly (17th March) 441 − (26 February) 57 = 384, and this was the length of Kali 3403; and so on.

It may be interesting to note that in every century there are on an average one year of 385 days, four years of 383 days, twenty-three years of 355 days, thirty-two years of 384 days, and forty years of 354 days.

*P. 98.*

*To end of Art. 160, add the following;*—"*160(a) To find the tropical (sâyana) as well as the sidereal (nirayana) saṅkrânti.* Find the time of the nirayana saṅkrânti (*see Art. 23*) required, by adding to the time of the Mesha saṅkrânti for the year (*Table I., Cols. 13 to 17a*) the collective duration of the nirayana saṅkrânti as given in col. 5 of Table III., under head "saṅkrântis." Then, roughly, the sâyana saṅkrânti took place as many ghaṭikâs before or after the nirayana one as there are years between Śaka 445 current, and the year next following or next preceding the given year, respectively.

"For more accurate purposes, however, the following calculation must be made. Find the number of years intervening between Śaka 445 current, or Śaka 422 current in the case of the *Sûrya Siddhânta*, and the given year. Multiply that number by $\frac{1}{60}$, or $\frac{3}{200}$ in the case of the *Sûrya Siddhânta*. Take the product as in ayanâmśas, or the amount of precession in degrees. Multiply the length of the solar month (*Art. 24*) in which the sâyana saṅkrânti occurs (as shewn in the preceding paragraph) by these ayanâmśas and divide by 30. Take the result as days, and by so many days will the sâyana sankrânti take place before or after the nirayana saṅkrânti of the same name, according as the given year is after or before Śaka 445 (or Śaka 422). This will be found sufficiently accurate, though it is liable to a maximum error (in A.D. 1900) of 15 ghaṭikâs. The maximum error by the first rule is one day in A.D. 1900. The smaller the distance of the given date from Śaka 445 (or 422) the smaller will be the error. For absolute accuracy special Tables would have to be constructed, and it seems hardly necessary to do this.

The following example will shew the method of work.

Wanted the moment of occurrence of the nirayana Makara saṅkrânti and of the sâyana Makara (or uttarâyana) saṅkrânti in the year Śaka 1000, current.

| | | d. | w. | h. | m. |
|---|---|---|---|---|---|
| Moment of Mesha saṅkrânti *(Table I.)* . . . . . . . | March 23 | (82) | 5 | 14 | 52 |
| Add collect. duration to beginning of Makara *(Table III.)* . . . . . | | 275 | 2 | 15 | 43 |
| Then the moment of the nirayana Makara saṅkrânti is . . . . . . | | 358 | 1 | 6 | 35 |

(One day being added because the hours exceed 24.)

358 = December 24th. 1 = Sunday.

The nirayana Makara saṅkrânti, therefore, occurred on Sunday, December 24th, at 6 h. 35 m. after sunrise. Now for the sâyana Makara saṅkrânti. By the Table given above we find that in the given year the sâyana saṅkrânti took place 9 days, 6 hours before the nirayana saṅkrânti; for A.D. 1000—445 = 555 ghaṭikâs = 9 days 15 gh. = 9 days, 6 hours, and it took place in nirayana Dhanus.

| | | d. | w. | h. | m. |
|---|---|---|---|---|---|
| Moment of nirayana Makara saṅk: | 24 Dec. = | 358 | 1 | 6 | 35 |
| Deduct . . . . . . . . . | 9 | 9 | 2 | 6 | 0 |
| | 15 Dec. | 349 | 6 | 0 | 35 |

This shews that the sâyana Makara saṅkrânti took place on Friday, Dec. 15th, at 35 minutes after sunrise.

(2) For more accurate time we work thus. 1000—445 = 555. Multiplying by $\frac{1}{60}$ we have $9\frac{15}{60}$, or 9° 15′ in ayanâṁśas. The length of the month Dhanus is 29 d. 8 h. 24 m. 48 s. *(Table, p. 10).*

$$\frac{29\text{ d. }8\text{ h. }24\text{ m. }48\text{ s.} \times 9^1/_4}{30} = \overset{d.}{9}\quad \overset{h.}{1}\quad \overset{m.}{11}\quad \overset{s.}{39}$$

We take 11 m. 39 s. as = 12 m., and deduct 9 d. 1 h. 12 m. from the moment of the nirayana Makara saṅkrânti, which we have above.

| | d. | w. | h. | m. |
|---|---|---|---|---|
| 24 Dec. | 358 | 1 | 6 | 35 |
| 9 | 9 | 2 | 1 | 12 |
| 15 Dec. | 349 | 6 | 5 | 23 |

This shews that the sâyana Makara saṅkrânti took place on Dec. 15th at 5 h. 23 m. after sunrise, the day being Friday.[1]

"The following Table may be found useful. It may be appended to Table VIII. and called "Table VIII. C".

[1] Actual calculation by the Arya Siddhânta proves that the sâyana saṅkrânti in question took place only 1 minute after the time so found. [S. B. D.]

## Table of Râśis (signs).

[The moments of the sankrântis are indicated by the first of the two entries in cols. 2 and 3. Thus the moment of the Simha sankrânti is shown by $s$ = 3333, degrees = 120°.]

| Râśis (signs.) | S. (See Arts. 133 and 156.) | Degrees. | Nakshatras forming the Râśis. |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| 1. Mesha | 0—833 | 0°—30° | 1. Aśvinî, 2. Bharaṇî, 3. First quarter of Krittikâ. |
| 2. Vrishabha | 833—1667 | 30°—60° | 3. Last three quarters of Krittikâ, 4. Rohiṇî, 5. First half of Mrigaśiras. |
| 3. Mithuna | 1667—2500 | 60°—90° | 5. Latter half of Mrigaśiras, 6. Ârdrâ, 7. First three quarters of Punarvasu. |
| 4. Karka | 2500—3333 | 90°—120° | 7. Last quarter of Punarvasu, 8. Pushya, 9. Âśleshâ. |
| 5. Simha | 3333—4167 | 120°—150° | 10. Maghâ, 11. Pûrva-Phalguṇî, 12. First quarter of Uttara-Phalguṇî. |
| 6. Kanyâ | 4167—5000 | 150°—180° | 12. Last three quarters of Uttara-Phalguṇî, 13. Hasta, 14. First half of Chitrâ. |
| 7. Tulâ | 5000—5833 | 180°—210° | 14. Second half of Chitrâ, 15. Svâti, 16. First three quarters of Viśâkhâ. |
| 8. Vrischika | 5833—6667 | 210°—240° | 16. Last quarter of Viśâkhâ, 17. Anurâdhâ, 18. Jyeshṭhâ. |
| 9. Dhanus | 6667—7500 | 240°—270° | 19. Mûla, 20. Pûrva-Ashâḍhâ, 21. First quarter of Uttara-Ashâḍhâ. |
| 10. Makara | 7500—8333 | 270°—300° | 21. Last three quarters of Uttara-Ashâḍhâ, 22. Śravaṇa, 23. First half of Dhanishṭhâ (or Śravishṭhâ.) |
| 11. Kumbha | 8333—9167 | 300°—330° | 24. Second half of Dhanishṭhâ (or Śravishṭhâ); 24. Śatatâraka (or Śatabhishaj), 25. First three quarters of Pûrva Bhadrapadâ. |
| 12. Mîna | 9167—10000 | 330°—360° | 25. Last quarter of Pûrva Bhadrapadâ, 26. Uttara-Bhadrapadâ, 27. Revatî. |

"160(*b*). The following is a summary of points to be remembered in calculating and verifying dates. The list, however, is not exhaustive.

**A.** A luni-solar date may be interpreted as follows:—

(I.) With reference to current and expired years, and to amânta and pûrṇimânta months.

(A) When the year of the given era is Chaitrâdi.

(*a*) For dates in bright fortnights, two possible cases; (i.) expired year, (ii.) current year.

(*b*) For dates in dark fortnights, four possible cases; viz., expired year, or current year, according to both the pûrṇimânta and amânta system of months.

(B) When the year is both Chaitrâdi and non-Chaitrâdi.

(*a*) For dates in bright fortnights, three possible cases; viz., (1) Chaitrâdi year current, (2) Chaitrâdi year expired = non-Chaitrâdi year current, (3) non-Chaitrâdi year expired.

(*b*) Dates in dark fortnights, six possible cases; viz., the same three years according to both the pûrṇimânta and amânta system of months.

For months which are common to Chaitrâdi and non-Chaitrâdi years, the cases will be as in (A).

(II.) With reference to the tithi.

All the above cases, supposing the tithi was current, (1) at the given time as well as at sunrise of the given day, (2) for the given time of the day, but not at its sunrise.

**B.** A solar date may be interpreted as follows —

(I.) With reference to current and expired years.

(A) When the year of the given era is Meshâdi, two possible cases; (*a*) expired year, (*b*) current year.

(B) When the year of the given era is both Meshâdi and non-Meshâdi, three possible cases; (*a*) Meshâdi year current, (*b*) Meshâdi year expired = non-Meshâdi year current, (*c*) non-Meshâdi year expired.

(II.) With reference to the civil beginning of the month, all the cases in Art. 28.

**C.** When the era of a date is not known, all known possible eras should be tried.

**D.** (*a*) According to Hindu Astronomy a tithi of a bright or dark fortnight of a month never stands at sunrise on the same week-day more than once in three consecutive years. For instance, if Chaitra sukla pratipadâ stands at sunrise on a Sunday in one year, it cannot stand at sunrise on Sunday in the year next preceding or next following.

(*b*) It can only, in one very rare case, end on the same week-day in two consecutive years, and that is when there are thirteen lunar months between the first and second. There are only seven instances [1] of it in the 1600 years from A.D. 300 to 1900.

(*c*) It cannot end on the same week-day more than twice in three consecutive years.

(*d*) But a tithi can be connected with the same week-day for two consecutive years if there is a confusion of systems in the naming of the civil day, naming, that is, not only by the tithi current at sunrise, but also by the tithi current during any time of that day. Even this, however, can only take place when there are thirteen lunar months between the two. If, for instance, Chaitra sukla 1st be current during, though not at sunrise on, a Sunday in one year; next year, if an added month intervenes, it may stand at sunrise on a Sunday, and consequently it may be connected with a Sunday in both these (consecutive) years.

(*e*) A tithi of an amânta month of one year may end on the same week-day as it did in the pûrṇimânta month of the same name during the preceding year.

(*f*) The interval between the week-days connected with a tithi in two consecutive years, when there are 12 months between them, is generally four, and sometimes five; but when thirteen lunar months intervene, the interval is generally one of six week-days. For instance, if Chaitra sukla 1st ends on Sunday (= 1) in one year, it ends next year generally on (1 + 4 = 5 =) Thursday, and sometimes on (1 + 5 = 6 =) Friday, provided there is no added month between the two. If there is an added month it will probably end on (1 + 6 = 0 =) Saturday.

(*g*) According to Hindu Astronomy the minimum length of a lunar month is 29 days, 20 ghaṭikâs, and the maximum 29 days and 43 ghaṭikâs. Hence the interval between the week-days of a tithi in two consecutive months is generally one or two. If, for instance, Chaitra sukla pratipadâ falls on a Sunday, then Vaisâkha sukla pratipadâ may end on Monday or Tuesday. But by the existence of the two systems of naming a civil day from the tithi current at its sunrise, as well as by that current at any time in the day, this interval may sometimes be increased to three, and we may find Vaisâkha sukla pratipadâ, in the above example, connected with a Wednesday.

**E.** (*a*) A saṅkrânti cannot occur on the same week-day for at least the four years preceding and four following.

(*b*) See Art. 119, par. 3.

160 (*c*) *To find the apparent longitude of Jupiter. (See Art. 63, p. 37, and Table XII.)*

I. To find, first, the mean longitude of Jupiter and the sun.

(i.) Find the mean longitude of Jupiter at the time of the Mesha saṅkrânti by the following Table W. That of the sun is 0° at that moment.

(ii.) Add the sodhya (Art. 26, p. 11, Art. 90, p. 52) given in the following Table Y to

[1] They are A.D. 440—1, 776—7, 838—9, 857—8; 1183—4, 1264—5, 1581—2.

the time of the apparent Mesha saṅkrânti (as given in Table I., cols. 13 to 17, or 17*a*). The sum is the moment of the mean Mesha saṅkrânti. Find the interval in days, ghatikâs, and palas between this and the given time (for which Jupiter's place is to be calculated). Calculate the mean motion of Jupiter during the interval by Table Y below, and add it to the mean longitude at the moment of mean Mesha saṅkrânti. The sum is the mean place of Jupiter at the given moment. The motion of the sun during the interval (Table Y) is the sun's mean place at the given moment.

**II. To find, secondly, the apparent longitude.**

(i.) Subtract the sun's mean longitude from that of Jupiter. Call the remainder the "first commutation". If it be more than six signs, subtract it from twelve signs, and use the remainder. With this argument find the parallax by Table Z below. Parallax is *minus* when the commutation is not more than six signs, *plus* when it is more than six. Apply half the parallax to the mean longitude of Jupiter, and subtract from the sum the longitude of Jupiter's aphelion, as given at the bottom of Table Z below. The remainder is the anomaly. (If this is more than six signs, subtract it from twelve signs, as before, and use the remainder.) With this argument find the equation of the centre [1] by Table Z. This is minus or plus according as the anomaly is 0 to 6, or 6 to 12 signs. Apply it to the mean longitude of Jupiter, and the result is the heliocentric longitude.

(ii.) Apply the equation of the centre (plus or minus) to the first commutation, the sum is the "second commutation". If it is more than six signs, use, as before, the difference between it and twelve signs. With this second commutation as argument find the parallax as before. Apply it (whole) to Jupiter's heliocentric longitude, and the result is Jupiter's apparent longitude.

*Example.* We have a date in an inscription.—"In the year opposite Kollam year 389, Jupiter being in Kumbha, and the sun 18 days old in Mina, Thursday, 10th lunar day of Pushya" [2]

Calculating by our method "C" in the Text, we find that the date corresponds to Śaka 1138 current, Chaitra sukla daśami (10th), Pushya nakshatra, the 18th day of the solar month Mina of Kollam 390 of our Tables, or March 12th, A.D. 1215. [3]

**To find the place of Jupiter on the given day.**

| | | | | | *gh.* | *pa.* |
|---|---|---|---|---|---|---|
| Apparent Mesha saṅk. in Śaka 1137 (*Table I., Cols. 13—15*) | 25 Mar. | (84) | Tues. | (3) | 3 | 32 |
| Add śodhya (*Table Y*) . . . . . . . . . . . . | 2 | 2 | | 2 | 8 | 51 |
| | 27 Mar. | (86) | Tues. | (5) | 12 | 23 |
| The given date is Śaka 1138 . . . . . . . . . . | 12 Mar. | (436) | | | | |
| | | (350) | | | | |

350, then, is the interval from mean Mesha saṅkrânti to 12 gh. 23 pa. on the given day. The interval between Śaka 1 current and Śaka 1137 current is 1136 years.

1 Neglecting the minutes and seconds of anomaly, the equation may be taken for degrees. Thus, if the anomaly is 149° 7' 49", the equation may be taken for 149°. If it were 149° 31' 12", take the equation for 150°. And so in the case of commutation. For greater accuracy the equation and parallax may be found by proportion.

2 *Indian Antiquary*, XXIV., p. 307, date No. XI.

3 The year 389 in the original seems to be the expired year. There are instances in which the word "opposite" is so used and I am inclined to think that the word used for "opposite" is used to denote "expired" (*gata*). The phrase "18 days old" is used to shew the 18th day of the solar month. [S. B. D.]

| | | Jupiter. Sign | ° | ′ | ″ | Sun. Sign | ° | ′ | ″ |
|---|---|---|---|---|---|---|---|---|---|
| Śaka 1 *(Table W)* | | 0 | 9 | 0 | 29 | | | | |
| Years | 1000 | 3 | 22 | 0 | 0 | | | | |
| " | 100 | 5 | 5 | 12 | 0 | | | | |
| " | 30 | 6 | 10 | 33 | 36 | | | | |
| " | 6 | 6 | 2 | 6 | 43 | | | | |
| At mean Mesha saṅk: | | 9 | 18 | 52 | 48 | | | | |
| Days *(Table Y)* | 300 | | 24 | 55 | 44 | 9 | 25 | 40 | 51 |
| " | 50 | | 4 | 9 | 17 | 1 | 19 | 16 | 48 |
| Mean long: on the given day | | 10 | 17 | 57 | 49 | 11 | 14 | 57 | 39 |
| Deduct Sun's mean longitude from that of Jupiter | | 11 | 14 | 57 | 39 | | | | |
| | | 11 | 3 | 0 | 10 | = first commutation. | | | |

*(Note that there are 30 degrees to a sign, and only 12 signs.)*

As this is more than six signs we deduct it from 12 signs. Remainder, signs 0, 26° 59′ 50″. Call this 27°.

Parallax for 27° *(see Table Z)* = 4° 20′.

| | Sign | ° | ′ | ″ |
|---|---|---|---|---|
| Mean longitude of Jupiter *(above)* | 10 | 17 | 57 | 49 |
| Add half the parallax | | 2 | 10 | |
| | 10 | 20 | 7 | 49 |
| Subtract longitude of Jupiter's aphelion *(bottom of Table Z)* | 6 | 0 | 0 | 0 |
| Anomaly | 4 | 20 | 7 | 49 |

4 signs, 20 degrees = 140 degrees. Equation of centre for argument 140° = *(Table Z)* 5° 25′. Deducting this from Jupiter's mean longitude found above (10s. 17° 57′ 49″) we have 10s. 14° 32′ 49″ = Jupiter's heliocentric longitude; and deducting it from the first commutation (11s. 3° 0′ 10″) we have, as second commutation, 10s. 29° 35′ 10″. Remainder from 12 signs, 1s. 0° 24′ 50″. Parallax for 1 sign, or 30°, *(Table Z)* = 4° 49′. Applying this (adding because the commutation is over 6 signs) to the heliocentric longitude of Jupiter we have (10s. 14° 32′ 49″ + 4° 49′ =) 10s. 19° 21′ 49″ as the apparent (true) longitude of Jupiter.

From this we know that Jupiter was in the 11th sign, Kumbha, on the given date.

## TABLE W.

*[For finding the mean place of Jupiter. Argument = number of years between Saka 1 and the given Saka year.]*

| Constant. (Mean longitude at mean Mesha Saṅkrânti in Saka 1 current.) | Signs | ° | ′ | ″ |
|---|---|---|---|---|
| Sûrya Siddhânta | 0 | 7 | 56 | 54 |
| First Ârya Do. | 0 | 9 | 0 | 29 |
| Sûrya Siddhânta with bîja | 0 | 5 | 49 | 4 |

| No. of years | Sûrya Siddhânta | | | | First Ârya Siddhânta | | | | Sûrya Siddhânta with bîja | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Signs | Degrees | Mins. | Secs. | S | ° | ′ | ″ | S. | ° | ′ | ″ |
| 1 | 1 | 0 | 21 | 6 | 1 | 0 | 21 | 7 | 1 | 0 | 21 | 4 |
| 2 | 2 | 0 | 42 | 12 | 2 | 0 | 42 | 14 | 2 | 0 | 42 | 7 |
| 3 | 3 | 1 | 3 | 18 | 3 | 1 | 3 | 22 | 3 | 1 | 3 | 11 |
| 4 | 4 | 1 | 24 | 24 | 4 | 1 | 24 | 29 | 4 | 1 | 24 | 14 |
| 5 | 5 | 1 | 45 | 30 | 5 | 1 | 45 | 36 | 5 | 1 | 45 | 18 |
| 6 | 6 | 2 | 6 | 36 | 6 | 2 | 6 | 43 | 6 | 2 | 6 | 22 |
| 7 | 7 | 2 | 27 | 42 | 7 | 2 | 27 | 50 | 7 | 2 | 27 | 25 |
| 8 | 8 | 2 | 48 | 48 | 8 | 2 | 48 | 59 | 8 | 2 | 48 | 29 |
| 9 | 9 | 3 | 9 | 54 | 9 | 3 | 10 | 5 | 9 | 3 | 9 | 32 |
| 10 | 10 | 3 | 31 | 0 | 10 | 3 | 31 | 12 | 10 | 3 | 30 | 36 |
| 20 | 8 | 7 | 2 | 0 | 8 | 7 | 2 | 24 | 8 | 7 | 1 | 12 |
| 30 | 6 | 10 | 33 | 0 | 6 | 10 | 33 | 36 | 6 | 10 | 31 | 48 |
| 40 | 4 | 14 | 4 | 0 | 4 | 14 | 4 | 48 | 4 | 14 | 2 | 24 |
| 50 | 2 | 17 | 35 | 0 | 2 | 17 | 36 | 0 | 2 | 17 | 33 | 0 |
| 60 | 0 | 21 | 6 | 0 | 0 | 21 | 7 | 12 | 0 | 21 | 3 | 36 |
| 70 | 10 | 24 | 37 | 0 | 10 | 24 | 38 | 24 | 10 | 24 | 34 | 12 |
| 80 | 8 | 28 | 8 | 0 | 8 | 25 | 9 | 36 | 8 | 28 | 4 | 48 |
| 90 | 7 | 1 | 39 | 0 | 7 | 1 | 40 | 48 | 7 | 1 | 35 | 24 |
| 100 | 5 | 5 | 10 | 0 | 5 | 5 | 12 | 0 | 5 | 5 | 6 | 0 |
| 200 | 10 | 10 | 20 | 0 | 10 | 10 | 24 | 0 | 10 | 10 | 12 | 0 |
| 300 | 3 | 15 | 30 | 0 | 3 | 15 | 36 | 0 | 3 | 15 | 18 | 0 |
| 400 | 8 | 20 | 40 | 0 | 8 | 20 | 48 | 0 | 8 | 20 | 24 | 0 |
| 500 | 1 | 25 | 50 | 0 | 1 | 26 | 0 | 0 | 1 | 25 | 30 | 0 |
| 600 | 7 | 1 | 0 | 0 | 7 | 1 | 12 | 0 | 7 | 0 | 36 | 0 |
| 700 | 0 | 6 | 10 | 0 | 0 | 6 | 24 | 0 | 0 | 5 | 42 | 0 |
| 800 | 5 | 11 | 20 | 0 | 5 | 11 | 36 | 0 | 5 | 10 | 48 | 0 |
| 900 | 10 | 16 | 30 | 0 | 10 | 16 | 48 | 0 | 10 | 15 | 54 | 0 |
| 1000 | 3 | 21 | 40 | 0 | 3 | 22 | 0 | 0 | 3 | 21 | 0 | 0 |
| 2000 | 7 | 13 | 20 | 0 | 7 | 14 | 0 | 0 | 7 | 12 | 0 | 0 |
| 3000 | 11 | 5 | 0 | 0 | 11 | 6 | 0 | 0 | 11 | 3 | 0 | 0 |

## TABLE Y.

*[Mean motion of Jupiter and Sun. Argument = number of days (ghaṭikâs and palas) between mean Mesha sankrânti and the given moment.]*

*(This is applicable to all the Siddhântas).*

| No. of days. | Jupiter. | | | | Sun. | | | |
|---|---|---|---|---|---|---|---|---|
| | s. | ° | ' | " | s. | ° | ' | " |
| 1 | 0 | 0 | 4 | 59 | 0 | 0 | 59 | 8 |
| 2 | 0 | 0 | 9 | 58 | 0 | 1 | 58 | 16 |
| 3 | 0 | 0 | 14 | 57 | 0 | 2 | 57 | 25 |
| 4 | 0 | 0 | 19 | 57 | 0 | 3 | 56 | 33 |
| 5 | 0 | 0 | 24 | 56 | 0 | 4 | 55 | 41 |
| 6 | 0 | 0 | 29 | 55 | 0 | 5 | 54 | 49 |
| 7 | 0 | 0 | 34 | 54 | 0 | 6 | 53 | 57 |
| 8 | 0 | 0 | 39 | 53 | 0 | 7 | 53 | 5 |
| 9 | 0 | 0 | 44 | 52 | 0 | 8 | 52 | 14 |
| 10 | 0 | 0 | 49 | 51 | 0 | 9 | 51 | 23 |
| 20 | 0 | 1 | 39 | 43 | 0 | 19 | 42 | 43 |
| 30 | 0 | 2 | 29 | 34 | 0 | 29 | 34 | 5 |
| 40 | 0 | 3 | 19 | 26 | 1 | 9 | 25 | 27 |
| 50 | 0 | 4 | 9 | 17 | 1 | 19 | 16 | 48 |
| 60 | 0 | 4 | 59 | 7 | 1 | 29 | 8 | 10 |
| 70 | 0 | 5 | 49 | 0 | 2 | 8 | 59 | 32 |
| 80 | 0 | 6 | 38 | 52 | 2 | 18 | 50 | 54 |
| 90 | 0 | 7 | 28 | 43 | 2 | 28 | 42 | 16 |
| 100 | 0 | 8 | 18 | 35 | 3 | 8 | 33 | 37 |
| 200 | 0 | 16 | 37 | 9 | 6 | 17 | 7 | 14 |
| 300 | 0 | 24 | 55 | 44 | 9 | 25 | 40 | 51 |

| | | *d.* | *gh.* | *pa.* |
|---|---|---|---|---|
| Śodhya = | Sûrya Siddhânta | 2 | 10 | 14 |
| | Ârya Siddhânta | 2 | 8 | 51 |

Motion for ghaṭikâs = as many minutes and seconds as there are degrees and minutes for the same number of days. Motion for palas = as many seconds as there are degrees for the same number of days.

*Example.* The motion of Jupiter in four ghaṭikâs is $19\frac{17'''}{60}$, or (say) 20 seconds. The motion of the Sun in five palas is $4\frac{55'''}{60}$, or (say) 5 seconds.

## TABLE Z.

*[For Equation of centre. Argument = Jupiter's anomaly.*

*For Parallax, Argument = commutation.]*

| Argument in degrees. | Parallax. | | Equation of centre. | | Argument in degrees. | Parallax. | | Equation of centre. | | Argument in degrees. | Parallax. | | Equation of centre. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | ′ | ° | ′ | | ° | ′ | ° | ′ | | ° | ′ | ° | ′ |
| 1 | 0 | 10 | 0 | 5 | 25 | 4 | 2 | 2 | 7 | 49 | 7 | 33 | 3 | 45 |
| 2 | 0 | 19 | 0 | 10 | 26 | 4 | 11 | 2 | 11 | 50 | 7 | 41 | 3 | 48 |
| 3 | 0 | 29 | 0 | 15 | 27 | 4 | 20 | 2 | 15 | 51 | 7 | 48 | 3 | 52 |
| 4 | 0 | 38 | 0 | 21 | 28 | 4 | 30 | 2 | 20 | 52 | 7 | 56 | 3 | 56 |
| 5 | 0 | 48 | 0 | 26 | 29 | 4 | 39 | 2 | 24 | 53 | 8 | 4 | 3 | 59 |
| 6 | 0 | 58 | 0 | 31 | 30 | 4 | 49 | 2 | 29 | 54 | 8 | 12 | 4 | 2 |
| 7 | 1 | 8 | 0 | 37 | 31 | 4 | 59 | 2 | 33 | 55 | 8 | 20 | 4 | 5 |
| 8 | 1 | 18 | 0 | 42 | 32 | 5 | 7 | 2 | 38 | 56 | 8 | 27 | 4 | 8 |
| 9 | 1 | 27 | 0 | 47 | 33 | 5 | 17 | 2 | 42 | 57 | 8 | 34 | 4 | 11 |
| 10 | 1 | 37 | 0 | 52 | 34 | 5 | 26 | 2 | 47 | 58 | 8 | 41 | 4 | 14 |
| 11 | 1 | 47 | 0 | 57 | 35 | 5 | 34 | 2 | 51 | 59 | 8 | 48 | 4 | 17 |
| 12 | 1 | 57 | 1 | 2 | 36 | 5 | 43 | 2 | 55 | 60 | 8 | 55 | 4 | 20 |
| 13 | 2 | 7 | 1 | 7 | 37 | 5 | 52 | 2 | 58 | 61 | 9 | 1 | 4 | 22 |
| 14 | 2 | 16 | 1 | 12 | 38 | 6 | 1 | 3 | 4 | 62 | 9 | 8 | 4 | 25 |
| 15 | 2 | 26 | 1 | 17 | 39 | 6 | 9 | 3 | 8 | 63 | 9 | 14 | 4 | 27 |
| 16 | 2 | 36 | 1 | 22 | 40 | 6 | 18 | 3 | 12 | 64 | 9 | 21 | 4 | 30 |
| 17 | 2 | 46 | 1 | 27 | 41 | 6 | 26 | 3 | 16 | 65 | 9 | 28 | 4 | 32 |
| 18 | 2 | 55 | 1 | 32 | 42 | 6 | 35 | 3 | 20 | 66 | 9 | 34 | 4 | 35 |
| 19 | 3 | 4 | 1 | 37 | 43 | 6 | 44 | 3 | 23 | 67 | 9 | 40 | 4 | 37 |
| 20 | 3 | 14 | 1 | 42 | 44 | 6 | 52 | 3 | 27 | 68 | 9 | 45 | 4 | 39 |
| 21 | 3 | 24 | 1 | 47 | 45 | 7 | 0 | 3 | 31 | 69 | 9 | 49 | 4 | 41 |
| 22 | 3 | 33 | 1 | 52 | 46 | 7 | 8 | 3 | 35 | 70 | 9 | 54 | 4 | 43 |
| 23 | 3 | 42 | 1 | 57 | 47 | 7 | 17 | 3 | 38 | 71 | 9 | 59 | 4 | 45 |
| 24 | 3 | 52 | 2 | 1 | 48 | 7 | 25 | 3 | 42 | 72 | 10 | 4 | 4 | 47 |

Longitude of the Aphelion of Jupiter, by Sûrya Siddhânta = 5 signs 21 degrees

„ „ „ „ „ „ „ Ârya Siddhânta = 6 „ 0 „

| Argument in degrees. | Parallax. | | Equation of centre. | | Argument in degrees. | Parallax. | | Equation of centre. | | Argument in degrees. | Parallax. | | Equation of centre. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ° | ′ | ° | ′ | | ° | ′ | ° | ′ | | ° | ′ | ° | ′ |
| 73 | 10 | 9 | 4 | 49 | 109 | 11 | 26 | 4 | 54 | 145 | 7 | 41 | 3 | 4 |
| 74 | 10 | 14 | 4 | 51 | 110 | 11 | 24 | 4 | 52 | 146 | 7 | 31 | 3 | 0 |
| 75 | 10 | 19 | 4 | 52 | 111 | 11 | 22 | 4 | 50 | 147 | 7 | 19 | 2 | 55 |
| 76 | 10 | 24 | 4 | 54 | 112 | 11 | 19 | 4 | 49 | 148 | 7 | 8 | 2 | 50 |
| 77 | 10 | 28 | 4 | 55 | 113 | 11 | 16 | 4 | 47 | 149 | 6 | 57 | 2 | 46 |
| 78 | 10 | 33 | 4 | 56 | 114 | 11 | 13 | 4 | 45 | 150 | 6 | 46 | 2 | 41 |
| 79 | 10 | 37 | 4 | 57 | 115 | 11 | 10 | 4 | 43 | 151 | 6 | 34 | 2 | 36 |
| 80 | 10 | 41 | 4 | 59 | 116 | 11 | 6 | 4 | 41 | 152 | 6 | 23 | 2 | 31 |
| 81 | 10 | 46 | 5 | 0 | 117 | 11 | 2 | 4 | 38 | 153 | 6 | 11 | 2 | 27 |
| 82 | 10 | 50 | 5 | 1 | 118 | 10 | 59 | 4 | 36 | 154 | 5 | 59 | 2 | 22 |
| 83 | 10 | 54 | 5 | 1 | 119 | 10 | 55 | 4 | 34 | 155 | 5 | 47 | 2 | 17 |
| 84 | 10 | 58 | 5 | 2 | 120 | 10 | 51 | 4 | 31 | 156 | 5 | 34 | 2 | 12 |
| 85 | 11 | 1 | 5 | 3 | 121 | 10 | 46 | 4 | 29 | 157 | 5 | 21 | 2 | 7 |
| 86 | 11 | 4 | 5 | 4 | 122 | 10 | 41 | 4 | 26 | 158 | 5 | 8 | 2 | 2 |
| 87 | 11 | 7 | 5 | 4 | 123 | 10 | 36 | 4 | 23 | 159 | 4 | 55 | 1 | 57 |
| 88 | 11 | 10 | 5 | 5 | 124 | 10 | 31 | 4 | 21 | 160 | 4 | 42 | 1 | 51 |
| 89 | 11 | 13 | 5 | 5 | 125 | 10 | 25 | 4 | 18 | 161 | 4 | 29 | 1 | 46 |
| 90 | 11 | 16 | 5 | 5 | 126 | 10 | 19 | 4 | 15 | 162 | 4 | 16 | 1 | 41 |
| 91 | 11 | 19 | 5 | 6 | 127 | 10 | 13 | 4 | 12 | 163 | 4 | 2 | 1 | 35 |
| 92 | 11 | 22 | 5 | 6 | 128 | 10 | 7 | 4 | 9 | 164 | 3 | 48 | 1 | 30 |
| 93 | 11 | 25 | 5 | 6 | 129 | 10 | 1 | 4 | 6 | 165 | 3 | 34 | 1 | 24 |
| 94 | 11 | 27 | 5 | 6 | 130 | 9 | 54 | 4 | 3 | 166 | 3 | 20 | 1 | 19 |
| 95 | 11 | 28 | 5 | 6 | 131 | 9 | 47 | 3 | 59 | 167 | 3 | 6 | 1 | 13 |
| 96 | 11 | 29 | 5 | 5 | 132 | 9 | 39 | 3 | 55 | 168 | 2 | 52 | 1 | 8 |
| 97 | 11 | 30 | 5 | 5 | 133 | 9 | 32 | 3 | 52 | 169 | 2 | 38 | 1 | 2 |
| 98 | 11 | 30 | 5 | 4 | 134 | 9 | 25 | 3 | 49 | 170 | 2 | 24 | 0 | 57 |
| 99 | 11 | 30 | 5 | 4 | 135 | 9 | 17 | 3 | 45 | 171 | 2 | 10 | 0 | 51 |
| 100 | 11 | 31 | 5 | 3 | 136 | 9 | 9 | 3 | 41 | 172 | 1 | 55 | 0 | 45 |
| 101 | 11 | 31 | 5 | 3 | 137 | 9 | 0 | 3 | 37 | 173 | 1 | 41 | 0 | 40 |
| 102 | 11 | 31 | 5 | 2 | 138 | 8 | 51 | 3 | 33 | 174 | 1 | 27 | 0 | 34 |
| 103 | 11 | 30 | 5 | 1 | 139 | 8 | 41 | 3 | 29 | 175 | 1 | 13 | 0 | 29 |
| 104 | 11 | 30 | 5 | 0 | 140 | 8 | 32 | 3 | 25 | 176 | 0 | 59 | 0 | 24 |
| 105 | 11 | 29 | 4 | 59 | 141 | 8 | 22 | 3 | 21 | 177 | 0 | 44 | 0 | 18 |
| 106 | 11 | 28 | 4 | 58 | 142 | 8 | 12 | 3 | 17 | 178 | 0 | 29 | 0 | 12 |
| 107 | 11 | 27 | 4 | 57 | 143 | 8 | 2 | 3 | 13 | 179 | 0 | 15 | 0 | 6 |
| 108 | 11 | 26 | 4 | 55 | 144 | 7 | 52 | 3 | 8 | 180 | 0 | 0 | 0 | 0 |

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(105)